QUALITY SEVRICES PROBLEMS AFFECTING CONSTRUCTION PROJECTS IN SAUDI ARABIA: A/E'S PROSPECTIVES

BY

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This thesis, written by **AMIR AZZAM NADEEM AKER** under the direction his thesis advisor and approved by his thesis committee, has been presented and accepted by the Dean of Graduate Studies, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE IN CONSTRUCTION ENGINEERING AND MANAGEMENT.**

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I dedicate this work to my beloved parents and family

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To Allah, and only Allah, who guided me to reach to this stage, who still gives me uncountable mercies, who is the beneficent, I pray and thank him knowing that his graces are beyond any human appreciation.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

QM	:	Quality Management.
A/E	:	Architectural Engineer.
AHP	:	Analytic Hierarchy Process.
QMS	:	Quality Management System.
PM	:	Project management
FM	:	financial management.
TQM	:	Total Quality Management.
QS	:	Quality Service.
P	:	Perception.
E	:	Expectation.
SERVQUAL	:	Generic instrument used to assess service quality.

ABSTRACT

Full Name : Amir Azzam Nadeem Aker

Thesis Title : Quality Services Problems Affecting Construction Projects in Saudi Arabia: A/E's Perspective.

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This Study investigates the quality service problems that affect the performance of the construction projects in Saudi Arabia from the perspective of (A/E) consulting companies. A questionnaire survey, adopting SERVQUAL instrument was used to collect the data. 63 responses received from the 200 surveys distributed among Saudi (A/E) consulting companies. The collected data was analyzed to identify the service quality gaps which affecting the achievement of QM in KSA. The gaps are then ranked according to their effects. The most significant dimensions due to the results of this research analysis are reliability and tangible. The problems which are occupying the first orders of the criticality ranking were: sincere in solving problems, keeping to schedule, performing correctly on the first try, and Having convenient operating hours. Class 3 contractors have the worst quality services among the other classes. A/E consulting Engineers' experience influence their quality services' perceptions and expectations of construction companies.

ملخص الرسالة

الاسم الكامل: أمير عزام نديم عكر

عنوان الرسالة: مشاكل خدمات الجودة التي تؤثر على المشاريع الإنشائية في المملكة العربية السعودية من منظور الإستشاريين

التخصص: هندسة وإدارة التشييد

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تتناول هذه الدراسة مشاكل خدمات الجودة التي تؤثر على تنفيذ مشاريع البناء في المملكة العربية السعودية من وجهة نظر الشركات الإستشارية. تم إستخدام استبيان خدمة الجودة (SERVQUAL) لجمع بيانات هذه الدراسة. ولقد تم استقبال 63 استبيان من أصل 200 استبيان تم توزيعهم على الشركات الإستشارية السعودية. تم تحليل البيانات لتحديد ثغرات خدمات الجودة التي تؤثر على تحقيق الجودة في المملكة العربية السعودية.

قامت الدراسة على ترتيب الثغرات وفق تأثيرها على المشاريع الإنشائية. ووفقا لنتائج تحليلات هذا البحث, كانت الأبعاد الأكثر تأثيرا هي المتعلقة بالموثوقية وخدمات الجودة الملموسة. أما المشاكل التي احتلت المراتب الحرجة فهي : عدم الإلتزام بجدولة المشاريع الهندسية وحل المشاكل الهندسية بإخلاص وبطريقة سليمة من قبل المقاول , سوء تنفيذ المقاول للأعمال الهندسية بطريقة صحيحة من المحاولة الأولى وعدم ملائمة ساعات العمل لظروف ومتطلبات المشاريع.

من نتائج الدراسة أيضا, إعتبار خدمات الجودة لمقاولين الدرجة الثالثة الأسوأ بين مقاولين الدرجة الأولى والثانية. ولقد أثرت خبرات المهندسين الإستشاريين بشكل واضح على توقعاتهم وإدراكهم لخدمات الجودة المقدمة من قبل شركات الإنشاء في المملكة العربية السعودية.

CHAPTER 1

INTRODUCTION

1.1 Research Problem

Competitive environment as well as large number of construction projects in Saudi Arabia enforces the construction firms to adopt and implement the total quality systems to maintain the construction project constraints; schedule, cost, no disputes, safety, and quality aspects. As indicated in the literature **(**Jha and Iyer, 2006**)**, the importance of quality compliance comes second next to schedule compliance in the construction projects. Understanding of quality in construction projects becomes more complex to meet the stated requirements of the designer (A/E), the contractor, the agencies and the project owner.

In the construction industry, total quality covers: quality culture in the construction firms; quality service of the construction projects, and quality of constructed facility (Ling and Chong, 2005). This study focuses on the construction quality services in Saudi Arabia and its related problems. Contractors and consultants are usually in close contact in construction from the early stages to the project's completion. The satisfaction level of the A/E consultants will be influenced by the quality service provided from the contactor side.

In the Middle East countries, and in KSA as well, the concept of quality still in the beginning as indicated by the construction experts who work in KSA. Quality problems are considered the main reasons beyond the conflicts between the contractors and the consultants (Bubshait and Abdulrazzak, 1996). Some of the previous studies conducted in KSA explored quality problems related to (Bubshait, 1999) (Bubshait and Abdulrazzak, 1996): employee training and education, design code establishment, working relationship, documentations, and internal checking.

There is a lack of research focusing on the quality services in KSA construction industry. Therefore, the importance of this study comes from the main concern about the quality services of construction projects in Saudi Arabia based on A/E consultants' perspectives.

1.2 Research Aim

This study aims to investigate the level of A/E's awareness of construction project's quality of Saudi Arabian construction performance.

To achieve this aim, three objectives have been formulated. First, to identify the quality service gaps affecting the performance of the construction projects in Saudi Arabia from the perspective of Architectural/Engineering (A/E) consulting companies. Second, to rank those gaps based on (A/E) consulting perspective. Third, to investigate the understand of Architectural/Engineering (A/E) consulting Engineers' on the quality services of construction projects in Saudi Arabia.

1.3 Research Approach

To achieve the research aim, this thesis starts with a literature review as discussed in chapter 2. The literature review covers the significant of such study in the construction, quality service as well as quality definitions have been explained, literature review explored the relevant quality service research, which has been conducted in Saudi Arabia and the other countries around the world. Chapter 3 explains the research problem and method, the body of the questionnaire have been illustrated in the research method.

The analysis and discussion of the collected data have been shown in chapter 4., The analysis of data correspondents to each objective have been clarified by the appropriate graphs and tables. Chapter 5 of this study includes the conclusion of the study, suggested future studies and general recommendations based on the results have been highlighted in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Total Quality Management (TQM) concept was originated in Japanese manufacturing industry because of non-existence of quality management practices and procedures. In the 1970s, benefiting from the experience of Japanese manufacturers, the concept has been adopted and applied within the construction industry. The results of application were noticeable in terms of productivity, expenditures and project reliability (Saraph et al, 1989) (Rustom and Amer, 2006) (Arditi and Gunaydin, 1997).

Much has been written about attainment of acceptable levels of quality, many researchers have identified quality and related systems used in the construction industry. Previous studies have discussed the importance of quality achievements through studying the quality management successful elements as well as investigating the elements that relevant within the country conditions. Like other country around the world, Saudi Arabia has its own studies presented the conditions and quality system problems in the construction projects. In recent years, more awareness has been paid by many construction firms to implement and improve their quality management systems (Heravitorbati el al, 2011) (Tarı´, 2005) (Antony et al, 2002).

This chapter contains revision of the related quality studies in KSA and overall the world, showing the importance of the quality studies in the construction, defining the

related concepts of quality, this chapter focuses on quality service and its dimensions, studies, and tools in the literature.

2.2 Why Quality?

Unlike other industries, the projects and products that are produced and built in construction industry are unique. It means that the services provided are not repetitive, as each specific project has own design, conditions, schedule, construction process and module unique to that project (Turk, 2006). From the managerial view, each project has triple constraints, which consists of schedule, cost and quality aspects. These aspects should be considered in a harmonious way. Sometimes, in order to meet the cost and time objectives, a valuable amount of sacrifice may be needed on the third constraint, the quality. However, the main challenge for all parties involved in construction projects is to do so without disregarding one aspect over the others. Several other studies have emphasized on the management and control of an installation performance of construction projects. Construction professionals classify the quality compliance come second next to schedule compliance **(**Jha and Iyer, 2006**)**.

Delivering of poor quality projects in construction has short term consequences in terms of additional cost of rework, repair and retest as well as productivity losing. In the long terms, poor quality products may harm the company reputation in the construction market. If companies in a specific country continue their quality ignorance in their performance, this will also reflect on the reputation of the country (Heravitorbati el al, 2011) (Arditi and Gunaydin, 1997). Construction firms' understanding and ability to identify critical success and failure factors could help them in minimizing the failure

factors and maximizing the success factors, which will ensure achieving quality goals in the construction industry (Pheng and Hwa, 1994).

Historically, a look at quality in construction gives some insight into the problem. Engineers and architects were responsible for assuring quality during the design phase. They carry out "supervision" role in the construction phase to ensure that the worth of the owner's money returned in terms of required quality. In the 1950s and 1960s, the widespread use of competitive bid in public as well as private sector forced the general contractor to turn the responsibility for some specialties over to subcontractors. Later in the 1980s, new type of firms came to the construction project delivery systems whereby management firms emerged to perform managerial functions and quality control till the project completion phase (Arditi and Gunaydin, 1997).

Due to the significance of quality achievement and to maintain acceptable levels of quality in construction, many relevant researches have discussed quality management philosophies, which have been considered as successful drivers for management strategies, and its adoption by every party in the construction industry (Heravitorbati el al, 2011),

Developing quality plan and monitoring the performance based on the quality control plan is recognized very essential due to the performance difficulties and risk that adversely affect the quality and customer satisfaction (Hernandez and Aspinwall, 2008). When the concepts and methods of quality are adopted in the project plan successfully, it would emphasize quality control requirements in the construction projects. The standards

and uniformity among quality control plan can make it more efficient to work and end up with balanced projects (Bubshait and Atiq, 1999).

Generally, large construction companies in Saudi Arabia are oriented to adopt and implement total quality systems which have activities to improve quality in all phases of construction projects. These trials might be stemmed by some difficulties and problems due to specific reasons. The importance of such research comes from the importance of quality itself, as the quality system and practices which adapted in Saudi construction projects should be evaluated to highlight the problems existing and illustrate the reasons beyond those problems. The continuous evaluation in any system will enhance and keep improving that system (Bubshait and Abdulrazzak, 1996).

2.3 Quality Definitions and Concept

Quality has many definitions in the literature. The following definitions show the understanding of quality based on the previous research, related concepts (TQM, QA, and QC), and some comparisons.

Definition of Quality

Many researchers and references discuss quality definitions with common concept and understanding. Quality in its simplest understanding can be defined as "fit for purpose" (Chan and Tam, 2000) (Alhwairini and Foley, 2012), "What the customer wants" (Alhwairini and Foley, 2012), "Conformance to customer's specifications" **(**Jha and Iyer, 2006**)**, "Right first time", and "Value for money" (Alhwairini and Foley, 2012). The simple understanding may become more complex when we want to put it into

actual practices. For the end users, their understanding that quality is nothing but full satisfaction with the appearance and project reliability for specific cost range **(**Jha and Iyer, 2006**)** (Alhwairini and Foley, 2012) (Chan and Tam, 2000). Quality is also defined (International Standardization Organization, 1994) (ISO 9000) as "The totality of features and characteristics of a product/service that bears on its ability to satisfy stated/implied needs" (Chan and Tam, 2000, P. 423).

The definition of quality in the construction field is meeting the requirements of the designer (A/E), the contractor, the agencies and the project owner (Arditi and Gunaydin, 1997). When the project is described with the term "high quality building project", it means that there are factors available in that project; its design is easily understandable and applicable, there will be compliance of design with specifications, economics of construction, operation and maintenance are easy and there will be efficient energy. The previous definition indicates the quality definition by a functional understanding of the project quality requirements (Turk, 2006).

Some experts define quality in construction as "meeting the legal, aesthetic and functional requirements of a project", quality is achieved when the specified requirements are suitable and adequate. The end product (Completed construction project) shall comply with the requirements which will be easy or complex (Arditi and Gunaydin, 1997).

The law describes the quality from the professional liability view point, the legal concept of quality requires from professional parts to realize their trade and perform it

responsibly every engineer who offers something to the owners is subject to professional liability laws (Arditi and Gunaydin, 1997).

The traditional definition of quality is based on belief that quality is measured by the aesthetics for facilities, how well building unite and mix into its surrounding, the psychological effects and impacts on its inhabitants. Because of the large subjective of aesthetic quality definitions, major disputes and doubts come in sight to whether quality has been achieved or not (Arditi and Gunaydin, 1997).

From all the previous researches, it is obvious that quality is meeting the requirements of the first step (designer, contractor, agencies as well as the owner). Arditi and Gunaydin (1997) study characterizes quality in construction project as complying with:

- owner requirements, such as adequate functional requirements, completing the project on time and within stated budget; meeting the effective Life cycle cost, operation and maintenance.
- design professional requirements, such as provision of clear scope of work; suitable budget to assemble and use qualified and experienced staff; adequate budget to get the required information prior to design, and contract to do the necessary work at a fair fee with a suitable allowance of time.
- constructor requirements. To permit constructor to prepare price or competitive bids, it is necessary for the consultants to provide the contract's plans, documents, specifications, sufficient details, well and timely explanation of requirements

from design and inspection staff, and contract for executing the work on rationale schedule which permit a suitable profit.

- with the agencies' requirements; such as meeting with public safety and health; environmental rules; save public utilities and compliance with applicable laws, codes and regulations.

Total Quality Management (TQM)

"Quality Management System" is an internal system for quality, which contains activities to increase confidence in order to achieve the intended quality for the management of organizations (Bubshait and Atiq, 1999). While, Total Quality Management (TQM) is a total system approach that involves an organization and permeates every aspect in the organization to develop objective strategic of quality through an integrated effort among personnel at all levels in order to obtain continuous customer satisfaction (Alhwairini and Foley, 2012) (Arditi and Gunaydin, 1997). TQM focuses on several things (such teamwork, involvement of customer and supplier, cost effectiveness, education and training, continuous improvement and reduce rework) to provide the culture and environment necessary for creativity and promote technology in construction (Arditi and Gunaydin, 1997) (Antony et al, 2002). Often, the term "business excellence" is used instead of (TQM) in some organizations. (TQM) create a wider connotation than the word "Quality" related to attributes of services or products (Alhwairini and Foley, 2012) (Arditi and Gunaydin, 1997). It is believed regarding to the implementation of TQM that the benefits of higher satisfaction and better quality products (Elghamrawy and Shibayama, 2008).

High level of Quality management in construction projects is provided by means of "Quality Assurance (QA)" and "Quality control (QC)" (Turk, 2006). "Quality Assurance (QA) system" is an external quality system consists of activities aimed to generate confidence for the customer's side that the supplier's quality system will bring out a product or service complied with the client's quality requirements. QA includes project related policies, standards, guidelines, codes, training, procedures, and systems essential to cause and generate quality, such programs are developed for each project by the design professional (A/E) (Arditi and Gunaydin, 1997). If the top administration which is responsible for engineering or construction adopts fully of quality management implementations, the whole quality system will succeed effectively (Bubshait and Atiq, 1999).

The importance of QA in construction has always appeared when it releases an early warning of a trouble ahead. The essential role of quality assurance is to protect the construction project against quality external and internal problems. One specific application of the QA program and activities is "Quality Control"; good QC will reduce the probability of mistakes and disputes. Because that quality control is a part of quality assurance, no mean to create a clear difference between them, in spite of the frequent use of the two terms interchangeably. The quality control (QC) function is nearest to the product in that activities are used to monitor the performance (Arditi and Gunaydin, 1997).

Unwittingly some organizations equate TQM (total quality management) with QA (Quality assurance) practices, TQM is considered as a number of integrated concepts that work to obtaining organizational excellence, while QA does not guarantee good quality,

but rather checks the specification compliance in the products (Alhwairini and Foley, 2012).

In fact, it should differentiate between "product quality" which are the quality elements directly and physical state of the product itself, and "process quality" which is related to the process that affects the product to be either acceptable or not. In the construction industry, it should be noticeable the difference between quality of materials, technology and equipment that are included in the building called "product quality" and the way the construction project managed in the three main phases of planning and design, construction and operation and maintenance (Arditi and Gunaydin, 1997).

It is known in the construction industry that the project has to be done at the scheduled time within the stated planned cost and at the required quality level. In some cases, quality might be influenced or ignored in order to shorten project duration or/and lessen costs (Turk, 2006). However, successful implementations of quality systems, which involves internal and external aspects aims to provide confidence about quality achievement's either internal or external aspects (Bubshait and Atiq, 1999).

Basically, the difference between "quality, in fact" and "quality in perception" should be realized, when the services or goods (that comply with specifications) achieve "quality, in fact", but do not meet the customer's requirement or their quality perception and vice versa. For instance, some high-rise building contains apartments might be pulled down because no one has the interest to live there. Despite of low rents, it means that the building can be of high quality, but yet it failed to fulfill the tenants' expectations of comfort, function and aesthetics (Arditi and Gunaydin, 1997).

Quality problems

During the construction process, the projects are still encountering various problems in terms of developing and achieving the acceptable levels of quality in the construction projects (Heravitorbati el al, 2011). According to the previous studies related to quality problems conducted in Saudi Arabia and all over the world, it highlights factors have considerable influences on the construction projects' quality. The literature discusses the following factors as part of the quality problem:

Managerial Factors: Key stakeholders have valuable effects on the project quality, as they are considered responsible for many quality problems in construction projects. Efficient relationships and communication among the involved construction parties will increase the quality achievements. People, their attitude, skills, and sufficient knowledge are the most important elements in the successful construction management. The prime contractor has to get approval regarding the subcontractors experience, qualifications and capacity before the beginning the work, because the subcontractor is the one who carry out project execution. Owner inspection teams and contractor's personnel should have the adequate experiences and qualification to handle the comprehensive quality plan which is created before (Bubshait, 2001) (Heravitorbati el al, 2011) (Saraph et al, 1989) (Najeh and Zaitri, 2007).

The first step which is expected from management is to recognize that there is a problem. Developing a comprehensive quality and operation plan from the early phase will ease that process, this might include objective determination, required process for

design and structure, selecting people, overall strategy and organizational chart (Chan and Tam, 2000) (Arditi and Gunaydin, 1997).

Codes and standards: The fundamental purpose of codes and standard is to protect health and safety, if the suitable codes and standards are not identified early, re-working can result in valuable problem in the project schedule and cost. The project quality design has to satisfy the criteria of applicable codes and standards, so that they will control the finished product quality. However, the owners might have particular requirements rather than the minimum criteria of codes and standards for the majority of the construction projects (Arditi and Gunaydin, 1997). In Saudi Arabia, there are special cases (temperature and soil class) will not allow using standards and criteria (Bubshait, 2001).

Technical factors: There are technical factors related to the documents, that result in poor quality in construction. The only two sets of documents which are provided by the designer to the constructors are specifications and drawings. The idea beyond these documents to show the required technical information related to the project design concept, size of the project and its items and how to assemble these items. Any non-clear or inadequate information in the drawings and specifications will affect the quality of the final project. On a related issue, there are frequently contradiction among both documents; drawings and specification. The importance of quality tools and techniques in the construction projects (like data collection system) lies in the early recognition of quality problems and defect (Heravitorbati el al, 2011) (Arditi and Gunaydin, 1997) (Najeh and Zaitri, 2007).

The Equipment, Materials, and Environmental factors: One of the external factors that influences project is the environmental factors, which may include physical, economic, industrial related and socio-political factors. Spectacular changes in environmental attributes cause uncertainty in terms of cost and investment among construction industry (Chan and Tam, 2000). Many researchers explore that the low quality or the lack of recourses like materials and equipment has the potential effect on the construction projects (Heravitorbati el al, 2011). Moreover, construction materials should always comply with the standards of building to end up with acceptable levels of quality.

Construction process: The clear project procedures will control the degree compliance with the required specification for the entire construction project; these procedures comprise the procedures of field sample on the project site, testing method, data analysis, procurement forms, etc. The competitive nature of selecting the project members might have a valuable degree of risk (Saraph et al, 1989) (Chan and Tam, 2000). If the project specifications do not show the procedures clearly, or it is not carried out properly, the whole project will end up with poor quality management under this factor (Bubshait, 2001).

The Cultural and political factors: Without a clear understanding of quality systems by the project members, their performance will cause quality problems on the projects (Leonard, 2010). Several types of human errors (like lack of motivation and low level of teamwork) should be avoided to achieve owners' commitment to all improvements in quality systems (Pheng and Hwa, 1994) (Heravitorbati el al, 2011)

(Najeh and Zaitri, 2007). The idea beyond this study came from the need to find out the gap, which is between the quality service expected by the consultants and those services provided by Saudi contractors (Ling and Chong, 2005).

2.4 Quality Service

Service, like quality, is a multidimensional term, and is still considered as a major differentiator between the firms in the market. High quality service is very important to increase the customers' satisfaction, in order to provide high service quality, it is needed to understand who the customer is and the requirements of the customer (Foster, 2010), service quality is a measure of whether the service level provided matches customer's expectations (Parasuraman et al, 1985) (Parasuraman et al, 1988). The service quality concept created during the 1990s (Newman, 2001) from the marketing discipline because of the hardness in applying product quality definitions for services (Forsythe, 2008) .Service quality includes certain attributes (intangibility, inseparability and heterogeneity) (Forsythe, 2008) (Foster, 2010):

- Intangibility: means that the service relates to being a personal performance, and it is not a series of uniform qualities formed by mechanical manufacturing processes. However, all the services have a few tangible attributes.
- Heterogeneity: indicates that the performance of the persons is changeable from a certain provider to the other, from a certain project to the other, and from a certain customer to the other, therefore, the service delivery is difficult to be uniformed similar as it is for manufactured products.

- Inseparability: there is no separation between production and consumption, so the quality services are measured during the performance.

In construction, it is necessary to indicate that the context of service quality differs from the context in the other industries; the production process and delivery occur simultaneously, differing from most other industries associated with the service delivery comes usually second after the production process (Forsythe, 2008). It is remarkable that during the design and construction stages of construction projects, the construction industry is considered a service industry and service quality (Forsythe, 2008).

Quality Service Gaps

The conceptual quality gap model (figure 2.1) aims to describe the relationships between the important variables of quality services. Such these models give the management level the ability to improve the quality of the firms by knowing the quality shortcomings in a systematic way. The gap model was created by Parasuraman et al (1988, 1991). The model describes the interaction between the activities and linkages to the satisfactory level of service quality. The gap means that there is a significant obstacle to reach the satisfactory level of service quality. The model can measure the perception of the five gaps; within the service provider, and between each party (Al-Saggaf, 1999).

Based on the literature concerned with quality service, one of the most widely applied generic instrument which is being used by scholars and practice managers to assessing service quality is "SERVQUAL", which was originally initiated by Parasuraman et al (1988, 1991) (Ladhari, 2009) (Babakus and Boller, 1992), it is used to diagnose service quality shortcomings and strengths (Hoxley, 2000).

The methodology idea of "SERVQUAL" is to assign customers' satisfaction zone by assessing the customers' perceptions of service quality, and then make the comparison with the pre expectations with the actual received services (Foster, 2010) (Ismail et al, 2010). Since the service provider who is the controller of the actual service, thus it is significant to develop standards for service quality features (Buttle, 1996). Referring to the concerning of this method to the services industries, KSA construction industry, as a service industry can be assessed by this tool.

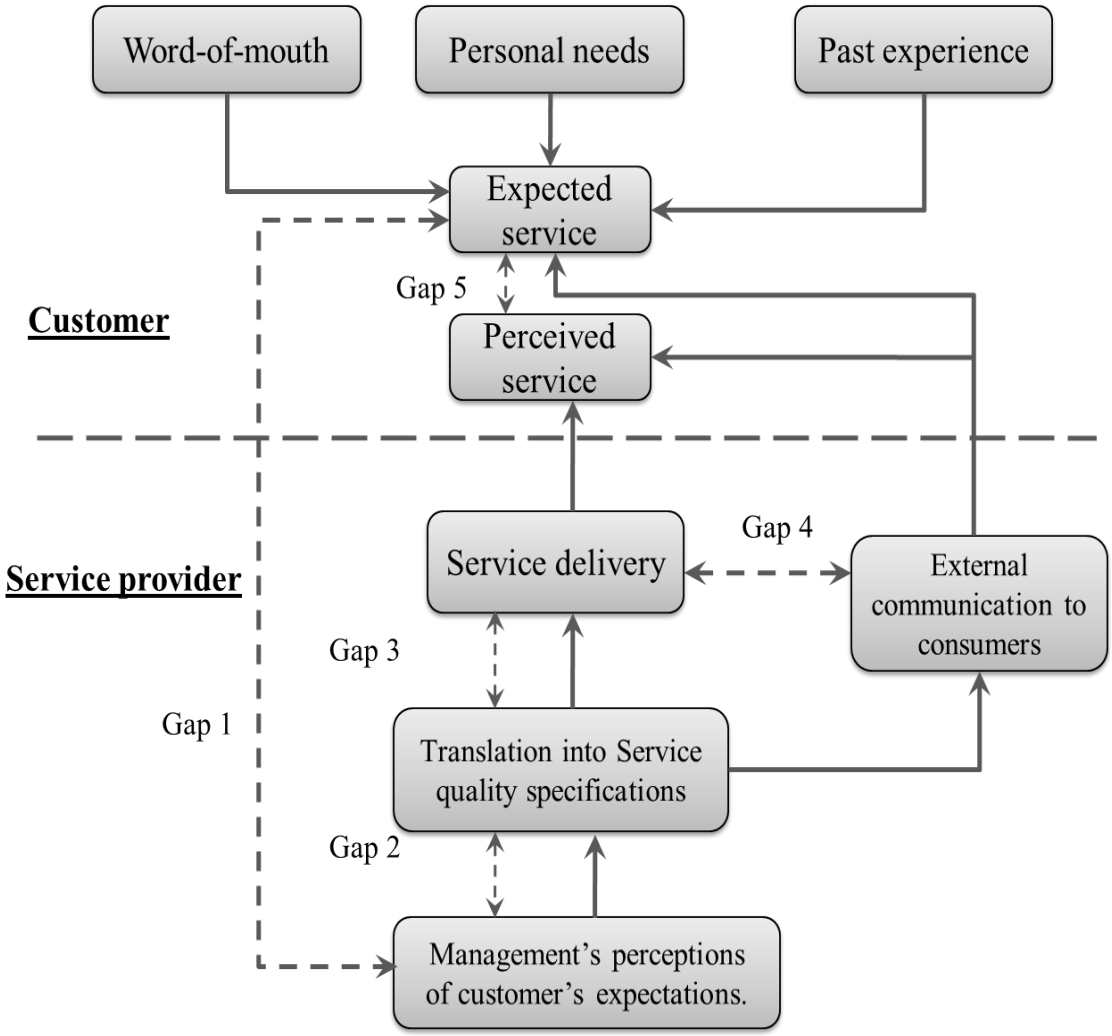


Figure 2. 1 The gap service quality model (Forsythe, 2008).

The five gaps that usually happen and have the effects on the perceptions of service quality shown in the figure 2.1. Based on the literature concerned with SERVQUAL tool, customers' perceptions of service quality are influenced by the five "gaps" below:

Gap 1

Gap 1 represents the difference between the actual expectations of customer and management perceptions or their concept about customer

expectations. This gap will appear when the management level of the provider underestimate or have misunderstanding of the customers' expectations. The gap between the customers' expectations and manager' perception of the services is larger in the services firms than it is in that produce tangible goods (Zeithaml et al, 1988).

$$\boldsymbol{Gap\ 1 = Customer's\ expectations - Management's\ perceptions} \quad \ldots (\mathbf{2.1})$$

If the difference (in equation 2.1) is low, which is better, it indicates that the management's understanding of the customers' requirements excellently. The gap 1 is a function of upward communication, management level, and marketing orientation research. . Some of the contractors in construction may not know the services, which have the highest importance and priority to the consultants' requirements to be delivered (Parasuraman et al, 1985).

Gap 2

Displays the mismatching between management's expectation level of service quality and their standards developed based on the quality services' understanding. This type of gap comes from the wrong translation of customer's expectations of the service quality to the specifications (Parasuraman et al, 1985).

$$\boldsymbol{Gap\ 2 = Management's\ perceptions - SQ\ Specifications} \quad \ldots (\mathbf{2.2})$$

If the difference (in equation 2.2) is low, which is better, it means that the management interprets the expectations into service quality specifications

perfectly. The quality service gap 2 value might be affected by task standardization, goal settings, and management involvement. In construction quality services, it is hard to develop suitable specifications to be delivered, because of lack of contractors' trained staff, or due to the fluctuations of consultants demand, and management's involvement one of the reasons (Zeithaml et al, 1988).

Gap 3

Gap 3 is the variance between the actually delivered services by the responsible personnel about the services, and the specifications built by management. This quality service gap occurs when the service delivery instructions do not ensure high quality performance (Parasuraman et al, 1985).

$$\boldsymbol{Gap\ 3 = SQ\ specifications - Service\ delivery} \quad \ldots (\mathbf{2.3})$$

If the difference (in equation 2.3) is low, which is better, in this case, the firms' staff delivers the suitable service level exactly as it is stated in the specifications. The construction contractor's staff has a considerable influence on the customers' satisfaction of service quality, it is difficult to maintain standardized quality in the services which involve a person. The construction firms reported that unsteady performance of labor causes this type of gap (Al-Saggaf, 1999). The main items can affect this gap are: supervisory systems, role conflict, and job fit (technology and staff) (Zeithaml et al, 1988).

Gap 4

This gap indicates to the difference between service delivery and the nature of external communications to consumers. When the service firm promises more than its capabilities. Word of mouth and other communications by the service provider will affect the expectations of the customers (Parasuraman et al, 1985).

$$\boldsymbol{Gap\ 4 = Service\ delivery - External\ communication} \quad \ldots (\mathbf{2.4})$$

If the difference (in equation 2.4) is low, which is better. That highlights the promotion program of the firm describes the delivered services properly. Construction firms have to guarantee that it's marketing and communication describes exactly provided services as well as the way it is delivered. The factors included in this gap are: horizontal communication between advertising, marketing, and performance, different procedures across branches, and the policy conflicts (Al-Saggaf, 1999) (Zeithaml et al, 1988).

Gap 5

Gap 5 is directly the difference between customer expectations and perceptions, the high or low service quality is measured based on how the customers perceive the actual services, in the base of what they expected (Forsythe, 2008).

$$\boldsymbol{Gap\ 5 = Expected\ Service\ delivery - Perceived\ service} \quad \ldots (\mathbf{2.5})$$

When the service quality gap 5 (in equation 2.5) is smaller, it means that there are high quality services within the firm's performance. Gap 5 depends

on the size of the service quality gaps corresponding to the provider's side (Zeithaml et al, 1988).

As Shown in figure (2.1), the gaps 2, 3 and 4 are related to the internal services of the provider and involve organizational culture. While, gap 1 corresponding to the both parties. The difference between gap 5 and other gaps is that gap 5 needs external measurement (Al-Saggaf, 1999) (Zeithaml et al, 1993). On the contrary of all other gaps that require internal measurement. Service quality depends on the gap 5 value and direction, the direction and magnitude of each gap have an effect on the gap 5 as well as service quality (Al-Saggaf, 1999).

The comprehension gap from those types is gap 5, it reflects the other gap problems, that is the reason behind analyzing gap 5 in this research rather than the other (Ladhari, 2009) (Foster, 2010).

2.5 Factors Affecting Quality Services

There are factors affecting the attainment of quality and quality services in the construction industry, that factors have been indicated in the previous studies. Many researches has been done in the construction industries around the word as well as in KSA; problems, factors, services, tools related to quality and quality services have been explained by the literature in this section.

2.5.1 Critical Factors in Previous Research

The following studies explore the relevant studies correspondents to this study in the literature. The revision discuss quality problems as general, quality studies based on

ISO9000, quality service and its related studies and tools (SERVQUAL) in the construction industries around the world.

Quality Problems Studies

Arditi and Gunaydin (1997) studied the literature review and surveys conducted in the USA, to understand the quality improvement in the construction field. They found the following considerations should be taken by the company's administrators and managers in order to develop the quality systems:

- Quality management commitments and continuous improvement in every building process phase.
- Provide all levels and phases of the construction process with sufficient TQM theory, and practice of education or training.
- Teamwork is necessary to improve quality performance; the whole project parties (manufacturer, subcontractor, main contractor, professional designer, project managers and even the owner) should be included in the partnering arrangements to achieve total quality.
- Feedback loops at each phase end will be used to upgrade the quality standards.
- Owner requirements have to be determined at the beginning of the project, so it will smooth the progress in the future.
- Uniformity and clarity of drawings and specifications is very critical.

Arditi and Gunaydin (1998) obtained the perceptions of the long experienced practitioners about the factors affecting quality in the different phases (design, construction, and operation) of a construction project Lifecycle. The findings of the

questionnaire survey indicated same specific factors that are considered by practitioners to enhance the quality. The factors include drawings and specifications' consistency, suitable and merit of contractors, suitable/adequate operation, and maintenance budget at the early design phase.

Serpell (1999) presented a summary of principal characteristics, problems, limitations and benefits of implementations of the quality system based on the ISO9000 in Chilean construction projects. According to the different evaluations from the participant, he has analyzed general characteristics and lessons learned from the implementation. The study gave special focus on the effect of quality systems on the relationship between the owner and its contractors. One of the main recommendations is oriented to guide local and foreign companies to develop quality system, basing it on the local construction market characteristics rather than external experience

Heravitorbati el al (2011) examined through extensive literature review the requirements, which are important to establish a framework leading to more effective stakeholders' involvement in quality practices, thus ultimately participating higher quality outcomes enhancement for construction projects. They have categorized quality issues with focus on the shortcomings and benefits of various perceptions of quality. The study proposed a set of criteria for the quality practices framework to achieve the stakeholders' targets for implementation and improve quality outcomes in future construct projects.

Jha and Iyer (2006) explored the reasons beyond the underperformance of the quality of construction projects in India. 55 quality factors have been surveyed to discover their effect on the project performance. The required statistical analysis has been

done on the questionnaire results. Two notable sets of failure and success factors have been established in the analysis results; the set of failure factors includes: hard climatic conditions, project managers' unawareness; conflict between the parties, wrong project perception, and the aggressive competition environment during tendering periods. The study established that management has a big influence on quality even in construction project execution.

Leonard (2008) examined which quality practices were really applied in the US homebuilding industry, and to what extent those practices have been applied. Leonard conducted a literature review on homebuilding quality in the US. He analyzed 22 case studies of the US homebuilders to highlight the implementations' details. Limited and immature quality applications were found in the homebuilding industry, the majority of senior project managers were still considering quality as a peripheral issue, and they were not persuaded with quality value. He concluded that there was a need for long term quality to go beyond the short term fad in quality management.

Hernandez and Aspinwall (2008) developed a new framework to override the limitations of some proposed quality management approaches in the construction projects, and also combined manufacturing improvement methods appropriate to construction projects. The framework includes: construction procedures, people and their culture, quality improvement methods, product quality, service quality, and guidelines for quality application. The framework treats quality from three perspectives:

- The framework is suitable with all the stages of construction.
- The framework supports communication with clients.

• The framework is applicable to the companies, regardless of the sector (e.g. Building, civil and engineering projects).

Chan and Tam (2000) have examined the factors which have a big correlation with good quality performance in Hong Kong. 110 recently finished construction projects have been examined and analyzed by using stepwise multiple regression analysis. This study shows that the most efficient predictor of client's satisfaction with quality was the PM practices by the project teams. While the other factors included the effectiveness of team leader, the clients' emphasis on quality and stated schedule.

Studies Based On ISO9000

Pheng and Wee (2001) have investigated the effect of ISO9000 on construction defects. This study showed how ISO9000 certification for contractors can affect their construction projects. The findings from an in depth case study derived clear understanding of the causes and mechanisms of defects. A conceptual framework for defect reduction has been built based on the model of quality Assurance.

Chin and Choi (2003) have identified the critical successful factors for contractors to implement ISO9000 in Hong Kong construction industry. Critical success factors have been examined through case studies in the construction industry. An Analytic Hierarchy Process (AHP) model was used to define the relative importance among the critical factors based on ISO9000. The findings due to AHP showed some insights for critical success factors in both contractors and consultants sectors. The results indicated that the most critical factor is the top management commitment. However, teamwork, training and education, and cultural changes have been considered the most common factors.

Din et al (2010) have explored the relationship between Quality Management System (QMS) certified based on ISO9000 and performance factors in the Malaysian construction environment. The required data collected based on a survey which was distributed to Malaysian project managers who are working in both ISO9000 certified and non-certified organizations. 336 samples were analyzed from both sides. Multivariate analysis of variance (MANOVA) was used to find the variations in the levels of performance between the two groups. The performance elements have been classified into three main groups of practices: Project management (PM), financial management (FM) and project success. The research findings explored that the certified firms have enhanced performance levels in the projects more than those for non-certified firms. The researchers have concluded also that the certification of ISO9000 has a moderate positive effect on the relationship between project management practices and project success.

Studies Based On SERVQUAL

Ladhari (2009) reviewed 20 years period (1988-2008) of research focus on measuring service quality and using SERVQUAL scale. Ladhari concluded that SERVQUAL remains a valuable instrument for service-quality researchers. Despite of numerous criticisms (includes; its predictive, discriminant, and convergent validity). The study encourages the researchers to adopt the SERVQUAL methodology to improve their own instrument for a specific industry or specific research contents; moreover, they should conduct reliability analysis to validate the instrument after data collection.

Hoxley (2000) argued service quality assessment in the UK by developing a scale consists of 26 items, the study relies on a generic service quality assessment tool

(SERVQUAL). The required data have been collected by involving 244 professionals by their clients. The study concludes that the scale is both valid (it does assess service quality) and reliable (it has internal uniformity). The findings of the research focus on construction professional service quality which could be described as a four- dimensional construct, the author has called the factors ``what", ``how", ``when" and ``who". Future uses of this scale have been proposed through the conclusion and discussion.

SIU et al (2001) tested (through the SERVQUAL approach) the quality services in the maintenance of mechanical and engineering services. The use of SERVQUAL approach has been illustrated by an empirical survey. This survey was oriented to the Australian clients and providers of the services. 50 samples from each group have been collected and analyzed in this research. The researchers used the (Gap) model to clarify the relationships between expected quality services, perceived quality services, customers' satisfaction, and quality gap. The gap analysis has been discussed in this study by the following points:

- The clients' expectations of quality services were overestimated by the service providers.
- The work of service providers was below the clients' expectations.
- The reliability dimension has been ranked to be the most serious dimension of services from the both sides.
- Tangible dimension was considered less important than the other three dimensions of responsiveness, empathy, and assurance.

Ling and Chong (2005) investigated the quality services of the design and build (DB) contractors' projects for public sector clients in Singapore country. They adapt the dimensions of the SERVQUAL instrument in their study; responsiveness, assurance tangible, reliability, and empathy. A questionnaire which consists of 34 attributes has been distributed to the clients. 30 sets of Clients' responses have been collected, then it has been analyzed in this study to end up with the following findings:

- The overall service quality score is - 0.678, which indicates that the perceived services is below the expectations of the clients.
- The dimension of reliability is the most significant between the other dimensions for quality services provided by (DB) contractors.
- It is recommended that contractors should try to appoint the suitable project managers.
- The BD contractors must enhance their ability to resolve the work conflicts quickly between the project's parties; they should share the common goals within the project team.

Lai and Pang (2010) assessed the service quality performance of the public housing maintenance contractors in Hong Kong. The method which has been used is based on the SERVQUAL instrument, in order to measure the expectations and perceptions of the housing owners. The return rate for the questionnaires was 80% of the sample size. 60 responses were valid for the study analysis. The quality services which have the lowest mean and the highest gap between the others are; providing the services at the time they promise, the availability of resources to conduct the promised service accurately (time, cost, and quality), work progress and submission of the required

documents with the stated quality and time. The authors recommended implications for industrial services and for future studies.

Cheng et al (2006) undertook a study of construction consultants' performance in the UK. They used a questionnaire based on the SERQUAL instrument, the distributed it to a random sample of UK clients. 61 fully completed questionnaires were gathered. The clients considered the efficient communications and their providers as the most important criteria in determining the satisfaction level.

Forsythe (2008) developed a theoretical model focusing on how would the service quality affect the customers' perceptions in the Australian housing construction. The model merged between the "gap model" and the "service quality model" to fit the design and construction process in the projects. The model assessed the dimensions of service quality that could apply the five stages' gaps (i.e. Briefing, design, execution, and final product gaps). The model might be used to produce a profile for customers' perceptions (focusing on service quality), those profiles enable the construction managers to qualify the customers according to the service quality requirements. The profiles might be used by the contractors to consider the quality services as more targeted means in a valuable competition in the construction market.

(Ismail et al, 2010) examined the quality services of the Malaysian contractors, who were working in the refurbishment projects for public institutions of higher education in Malaysia, Data have been collected by questionnaire using SERVQUAL as a tool, which includes 32 services have been assessed according the client's expectations and perceptions. Between the five dimensions (reliability, responsiveness, assurance,

empathy, and tangibles) in the questionnaire, the results show reliability services are the most serious services, that clients at public institutions of higher education have high expectations in terms of service quality from refurbishment contractors.

Qiao and Feng (2013) improved the SERVQUAL (service quality) model to carry out Post Occupancy Evaluation (POE) on the service quality of the community greenland environment in China. The study focuses on the difference between the service quality perceived by the users and their expectations, which are valuable to detect the problems in the construction of community greenland, the research concluded that the SERVQUAL model and AHP model can assess the quality services of the greenland environment more rationality. 12 indexes were combined in 6 dimensions have been considered in the quality service evaluation. The authors selected the indexes based on two basics: the first basic was the essential requirements of the community greenland service quality, the second one was according to the literature review. The research results indicate that there are significant gaps of the service quality of the community greenland environment. The results also created a basis for the renovation of the community greenland environment, and develop the guide for their new construction.

2.5.2 SERVQUAL Categories

A modified version of service quality assessment tool (SERVQUAl) proposed by (Parasuraman et al, 1991) which contained 22 quality service items were collapsed into five dimensions, due to the overlapping a crossing the 22 determinants of service quality produced by the provider of services; the following dimensions have been adopted in the previous construction studies as, and have been considered in this study as follows:

• ***Tangibles***

The tangible criteria are considered more important in high range contact services (i.e., building conditions) (Jannadi et al, 2000). This dimension includes the following services:

- Modern equipment (service 1): the contractors have modern-looking equipment; he has sufficiency and adequacy of equipment.
- Providence physical facilities (service 2): the contractors have physical facilities visually appealing (such as workshops, Storages, Offices and warehouses).
- Neatness appearance (service 3): the contractors' employees are neat-appearing (such as clean, tidy and use of PPE: Personal Protection Equipment).
- Providence the visually appealing materials (service 4): the contractors have associated materials with the service (such as computers, software and system) are visually appealing.

• ***Reliability***

In the criteria of reliability dimension, its concern will be on the contractor's capability of providing the promised services reliably and with accurate way. Reliability dimension includes the following services:

- Completing the task on time (service 5): when the contractor promises to do the construction activities by a certain time, he does so (completing the task on time).

- Solving problems sincerely (service 6): when the entire situation in the construction projects has any type of problems, the contractor shows a sincere interest in solving it.
- Performance on the first try correctly (service 7): there are some construction services required from the contractor to perform it right the first time.
- Providence as they promise (service 8): the contractor provided the services at the time and state he promises to do so before.
- Error-free records (service 9): the contractor has a system ensures records free of errors.

• ***Responsiveness***

Responsiveness criteria indicate to the effectively and promptly dealing with the customer requirements and complaints by the service provider, Responsiveness combines the following services:

- Keeping to schedule (service 10): the employees of the contractors give exactly when the services will be performed (i.e. Following the agreed/approved schedule).
- Prompt service (service 11): the employees of the contractor do prompt service when it is needed without any delays.
- Willing to help (service 12): the employees of the contractor are always willing to help, they always have the intention to help.

- Never too busy to respond (service 13): the employees of the contractor are never too busy to react to the requests, the number of the employees is sufficient.

• ***Assurance***

This dimension refers to the knowledge, experience, courtesy, and willingness to maintain client confidence and trust

- Instill confidence in customers (service 14): the behavior of contractor's employees instills have confidence.
- Customers feel safe (service 15): in the transactions with the contractors the consultant feels safe; the contractor does not have the intention of cheating in the common transaction. The contractor makes customers feel secure in leaving the project his hands
- Courtesy to customers (service 16): the employees of the contractor are consistently courteous (polite) with the consultants.
- Ability to answer customers' questions (service 17): the employees of the contractor have enough knowledge to answer the consultants' questions.

• ***Empathy***

Empathy involves caring, providing individualized attention and understanding the customer's needs (Jannadi et al, 2000).

- Giving customers individual attention (service 18): the contractor gives the consultants individual attention in the work environment.

- Having convenient operating hours (service 19): the contractor has operating hours that meet client's requirements and project constraint, operating hours are convenient.
- Employees give customers personal attention (service 20): The employees of the contractor seek to give personal attention in the direct transaction.
- Having customers' best interests at heart (service 21): the contractor has high interests at heart in terms of providing suitable services.
- Understanding the specific needs of customers (service 22): the contractor understands the specific needs of consultants and work conditions.

2.6 Construction Project Quality in Saudi Arabia

The need of quality concern is becoming very essential in KSA, because of the massive amounts of projects in the construction industry. According to the continuous increasing of the job size, the quality problems in KSA become more various. Based on the previous studies in Saudi Arabia, the following quality studies have been carried out in Saudi construction industry:

Bubshait (2001) showed the direct and indirect factors which were contributing to pavement performance quality in Saudi Arabia; the factors were achieved by a comprehensive literature review and contractors survey. The performance factors were divided into three main groups; managerial related, construction related, design/specification related factors. Factors that affect the pavement quality of performance were identified and ranked on a scale related to their effect. The finding showed that the newly constructed highway pavements in Saudi Arabia have exhibited a lower quality performance.

Bubshait and Al-Abdulrazzaq (1996) surveyed 38 engineering consulting office in Saudi Arabia regarding their design and quality management activities (quality services), the survey includes: writing job descriptions of quality managers, documentation, training, communication, control of drawings and specifications, qualification of key personnel, design reviews, standardization of office procedures, availability of office library facilities, peer reviews, monitoring of schedules and costs, and incentive systems. The results of this research did not view a conclusive since only a limited number of engineering firms participated in the survey.

Bubshaiat et al (1999) identified several practices of quality services. They have classified the practices into fifteen sections. All these practices have been surveyed among the Saudi local design organizations. The questionnaires were distributed to the 140 consulting organizations in the eastern province, 25 organizations participated in the survey. The research highlighted significant needs to invest in the quality sections in Saudi Arabia; "working relationship", employee training and education' and performance quality audit'. They concluded needs also for a design code establishment between the local design organizations in Saudi Arabia.

Abdul Razzak (1993) collected the questionnaires by mailing them to the consultant offices and contractors to determine QM activities used in the design and execution the construction project execution in Saudi Arabia. He showed that quality management activities like plans and specification uniformity have the greatest importance, whereas the education of employees has the least importance for the consulting offices, whereas for contractors, subcontractor evaluation and lab tests of materials are the most important QM activities from the contractors' view.

Bubshait and Al-Atiq (1999) have evaluated 15 contractors in Saudi Arabia construction industry in terms of their quality systems. They have discussed quality assurance systems and its role in preventing quality problems in those organizations, the results of the evaluation have pointed out the complexity of the contractor systems which has been sorted from informal inspection and test system to a comprehensive system. There were clauses of ISO9000 complied with some organizations like; inspection and test status and non-conformance product control. The following clauses were the least complied with the entire conditions of quality systems in the Saudi construction industry; control of design, internal checking, QS documentations, training, and required statistical techniques.

2.7 Conclusion

Quality service is gaining more attention from all companies that seek about competitiveness in Saudi construction market. In spite of the huge numbers and sizes of construction projects as well as the multinational contractors working in the Saudi construction field, each project has its own requirements and difficulties related to the specification, design and practices of performance. Based on numerous studies around the world and within Saudi Arabia construction industry, it is found that quality services should be continuously improved to avoid the problems which appear in the construction projects. This study will continue the relevant studies conducted all around the world and in Saudi construction industry, and explore the gaps of performing the quality services (Bubshait and Abdulrazzak, 1996) (Bubshait and Atiq, 1999).

Due to the lack of Saudi studies focus on the quality services provided by the contractors, and the lack of research based on the perspectives of consultants using

SERVQAUL tool, this study is considered very important to highlight the gaps between the expectations and perceptions of the consultants about the current quality services in Saudi construction industry.

CHAPTER 3

RESEARCH METHOD

3.1 Introduction

The previous chapter identified that limited numbers of relevant researches have been done about quality services in the construction industry in Saudi Arabia. The main concerns of these researches have been on the issues and factors which are affecting the quality services from A/E consultants' perspectives. This chapter discusses the research problem, research aim and the method selected to achieve the aim.

3.2 Research Problem

Due to the lack of research focusing on the A/E's perspective on quality management in Saudi Arabia, this study aim to investigate the level of A/E's awareness of construction project's quality of Saudi Arabian construction performance.

The aim of the research can be clarified by the following objectives:

- To identify the quality service gaps that affect the performance of the construction projects in Saudi Arabia from the perspective of Architectural/Engineering (A/E) consulting companies.
- To rank the quality service gaps that affect the performance of the construction projects in Saudi Arabia based on (A/E) consulting perspective.
- To understand Architectural/Engineering (A/E) consulting Engineers' perceptions of the quality services of construction projects.

3.3 Selection of Research Method

In general, among the various research methods, as shown in the table 3.1, there are three conditions within research objectives, which are considered the sources of selecting the suitable research method. These conditions consist of:

• The type of proposed research questions.

• The control level over current behavioral by the researcher.

• The focus degree on the contemporary events required from the research objectives.

Table 3. 1 Relevant condition for various research methods (Yin, 2009, p.8)

Method	A form of research questions	Required control of behavioral events?	Focuses on contemporary events?
Experiment	Why, how?	Yes	Yes
Survey	What, Who, where, how much, how many?	No	Yes
Archival Analysis	What, Who, where, how much, how many?	No	Yes/no
History	Why, how?	No	No
Case Study	Why, how?	No	Yes

From the previous conditions, the most important condition to differentiate between the research methods covers is the research questions' category being asked, as known, the common series: "what," "Who," "where," "why," and "how" questions. If the research question type focus on "what" questions, basically, two main types of "what" questions may arise. The first one related to conducting an exploratory study (in this case, any of the research methods might be used), the second type focuses on the prevalence of the phenomenon (in this case, the preferred methods are the survey and analyzing the data from archival records). On the contrary, "Why" and "Who" types cause to use experiments or case studies, because of an explanatory nature of them. On a related issue, literature review may help to determine the answers to these research questions in the past (Yin, 2009).

For this study, the main concern is to assess the prevalence of quality services among the construction companies in Saudi Arabia and evaluate the current status. Following to the preferable research method for this kind of research's case (Yin, 2009), the survey method will be used to gather the required data from the current construction industry in Saudi Arabia. To determine the insightful and more significant questions for this research survey, literature review as a mean will be adopted till the final stage of this research (Yin, 2009).

3.4 Description of Research Method

To achieve the aim of the research, survey type has been used. The questionnaires were adopted based on SERVQUAL tool, in order to investigate the service quality in the Saudi construction industry based on (A/E) consulting responses. SERVQUAL is a tool has been considered in the previous literature when the quality services were the

concerns. The questionnaire of this research includes two parts of questions. The full copy of the questionnaire is attached in the appendix. The questionnaire has been distributed among Saudi (A/E) consulting firms in the construction industry in Saudi Arabia. The collected data have been analyzed to find out the quality services' gap (gap 5; the deference between the expected and perceived services) which affect the achievement of QM in Saudi construction projects. General recommendations as a result of this questionnaire analysis will be discussed in the following chapter.

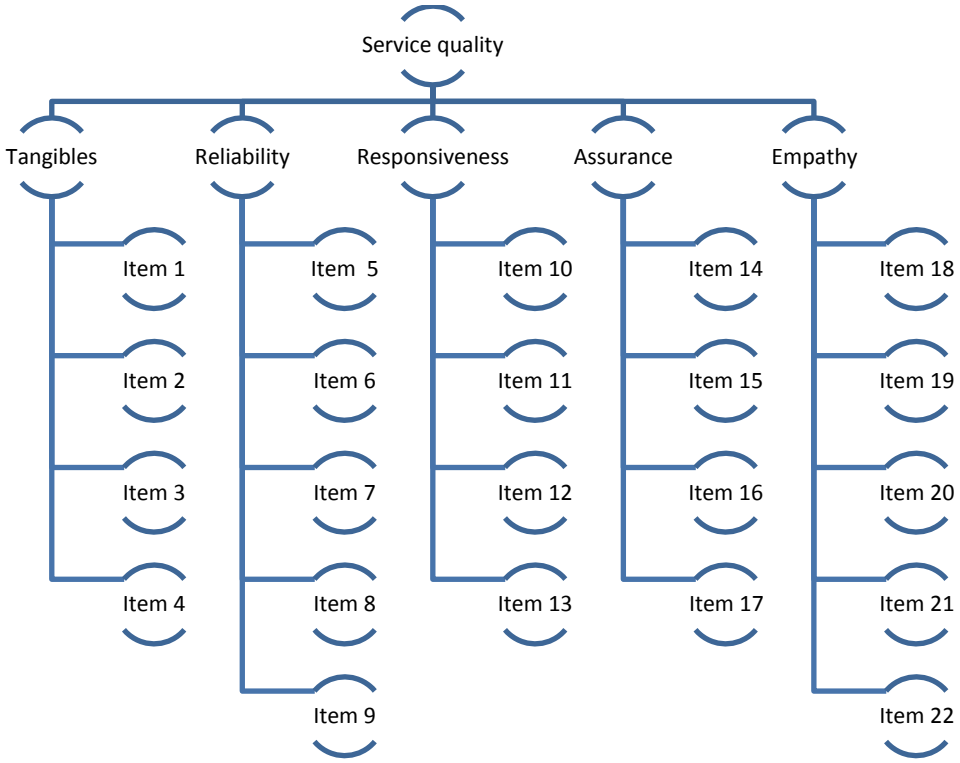


Figure 3. 1 The SERVQUAL model for the quality services

The main interest of the first part of the questionnaire is oriented to general and demographic information about the respondents; size of the respondents' job is one of those general questions, choices for the contractor classifications who are working with the respondents is vital wondering to be asked about as well. The respondents' general

experience in the construction field and in the Saudi Kingdom are also important questions to be answered. Other types of contact and general questions were included in this part (i.e. Respondent's job position, nationality, and telephone).

The second part is the core of the research's aim, it investigates the quality services using the SERVQUAL instrument in the body of this questionnaire. SERVQUAL consists of 22 quality services to be asked to the respondents, these items divided into 5 dimensions (tangible, reliability, responsiveness, assurance, and empathy), each item from these dimensions should be evaluated by the engineers in two columns (expectations and perceptions). The respondents should rank his expectations for a certain service item using the SERVQUAL scale, the scale starts with strongly disagree (scale 1), and ending with strongly agree (scale7). The scale shows the importance of the quality services. If the service has higher rank , it will have high importance according to their needs or understanding of that item. Same scale is assigned for the engineers' perception of the actual services provided by the contractors.

Over the previous quality studies using SERVQUAL tool, the tool has been used by certain companies in the practical field in every industry as well, their interest is to assess and enhance their quality service level. SERVQUAL as a tool in quality surveys, has valuable advantages. Among these are the following (Foster, 2010):

- It is realized as a standard for evaluating quality services by different dimensions.
- It has been noted to be applicable for multi service situations.

- It is reliable as it is; many respondents interpret the questions with the same meaning.
- Since this instrument has 22 items, this means that it might be supposedly filled out quickly by the respondents, so the results might be more reliable. The respondents always concentrate with the short period surveys.
- The standard procedure of the analysis of this tool is clear to help results' interpretations

3.5 Description of Research tasks

To achieve the objectives of this research, the following tasks arrange the work flow of the research:

Task 1: Literature review; through the relevant previous studies in Saudi Arabia and around the world. There are related studies concentrates on the quality services in the construction and other industries. Those studies have been considered as a base for this research.

Task 2: Questionnaire survey has been developed using the SERVQUAL instrument, then it has been distributed to the Saudi (A/E) consulting companies. Each question will discuss the expectation and perception for a specific service by the scale of respondent. Two forms; hard-copy (paper based) and online questionnaire survey were used to collect the data. The interest of this part is to assess the quality services provided by the contractors of Saudi Arabia. The classification of contractors in Saudi Arabia is based on contractor's capabilities (economy, technicality, and management) to do the work. For each type of work in the industry, there are related economic limitations for the

project's maximum money value. Table (2.1) shows the economic limitations for the contractor classifications per each type of the work (Saudi contractor's classifications-MOMRA, 2014).

Table 3. 1 Economic project value for each class of contractors

No.	Type of work	Contractor classes and highest project value in Saudi Riyals				
		Class 1	Class 2	Class 3	Class 4	Class 5
1	Building	>280	280	70	21	7
2	Transportation	>420	420	140	42	14
3	Water supply and drainage	>420	420	140	42	14
4	Electrical work	>280	280	70	21	7
5	Electronic work	>280	280	70	21	7
6	Telecommunication	>280	280	70	21	7
7	Mechanical work	>280	280	70	21	7
8	Industrial work	>420	420	140	42	14
9	Marine	>420	420	140	42	14
10	Dams	>140	140	70	21	7
11	Landscape	>140	140	42	21	7
12	Building maintenance	>140	140	42	14	4.5
13	Transportation maintenance	>140	140	42	14	4.5

Task 3: Data analysis; by using the suitable statistical analysis tools to the data collected. Demographic data have been analyzed, followed by service quality gap identification. The analysis ranked the significance of the quality services. The quality service gaps are studied across the experience of respondents, as well as the contractor classes.

Task 4. Discussing and concluding of the results; general recommendations are explored according to the gaps resultants.

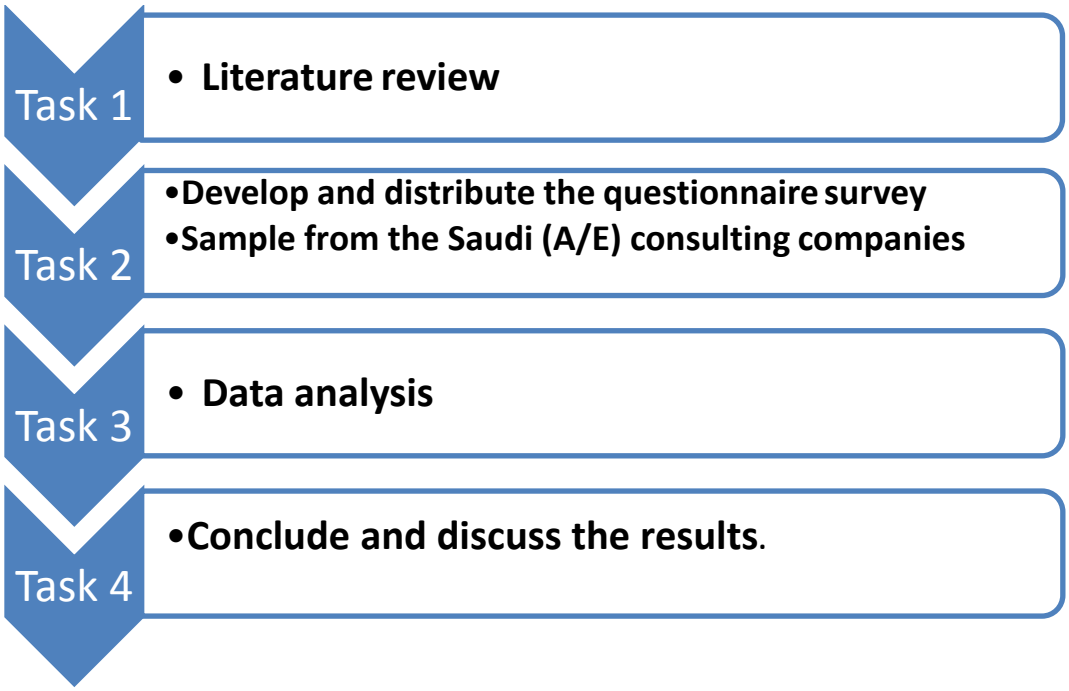


Figure 3. 2 shows the research methodology in this study

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The aim of this research is to investigate the level of A/E's awareness of construction project's quality of Saudi Arabian construction performance. This chapter reports the data analysis results and the findings. The analysis considers demographic information and satisfaction level of the respondents to find the quality service gaps (gap 5) of the Saudi construction companies. Relations between the gap and other demographic parameters will be presented in this chapter.

4.2 Demographic Analysis

The population sample for this study includes Saudi consulting companies and A/E's offices of the whole country. 200 questionnaires have been distributed among Saudi consulting companies and A/E's offices. 63 responses have been collected from that distribution process. Two forms; hard-copy (paper based) and online questionnaire survey were used to collect the data. The responses which are not fully completed were omitted from the analysis.

Of the 63 responses that have been collected, 84% of the them come from the A/E consulting companies with an average job (project) size of more than 50 millions Saudi riyals. 8% of the respondents have (10-50) millions S.R. Average job size, and the 8% has (1-10) millions S.R. Average job size. The samples of the respondents with an average job size of up to 50 million SR is significantly lower than the respondents with

the average job size of more than 50 million SR. For that reason, the analysis considered only 50 responses, which is portion that represents the consultants who have job size more than 50 millions Saudi riyals.

4.2.1 Demographic Analysis of The Respondents

The data which have been collected through the questionnaire survey focused on consulting and designing companies working in Saudi construction industry. The responses were from the engineers who are working in such companies. One consulting entity may include more than one respondent to fill the questionnaire. The reason for this, is that typical A/E consulting companies have worked or are working on more than one project.

Years of experience for each participant have also been collected in the first part of the questionnaire. This data is collected to investigate the relationship between the years of experience and the gaps between the expectations and perceptions provided per each dimension. The average of experience for the participants is 13 years, and the standard deviation is 9.3. As indicated by the table 4.1, Fourty two of (42%) of the respondents have 1-10 years' experience in the construction, another 40% has 10-20 years of experience, and the rest of the respondents (18%) have worked more than 20 years in the construction field.

Table 4. 1 Years of A/E's experience in the construction industry

Experience of respondents (years)	Number of respondents per the experiences	% of respondents per the experiences
1-10	21	42%
10 - 20	20	40%
More than 20	9	18%
Overall	**50**	**100%**

The average experience of the participants in the Saudi construction projects is 7 years, and the standard deviation is 7.1. The tables 4.2 shows statistics related, 57% of the respondents have (1-5) years' experience in the Saudi industry, 25% of the sample worked between 5 to 10 years in Saudi industry, and 16% of them worked more than 10 years in the Saudi construction industry.

Table 4. 2 Years of A/E's experience in the Saudi construction industry

Experience of respondents (years)	Number of respondents per the experiences	% of respondents per the experiences
1-5	29	57%
5-10	13	25%
More than 10	8	16%
Overall	**50**	**100%**

4.2.2 Demographic Analysis of The Contractors

The Saudi governmental classification divides the contractors in terms of their capacity to work in the construction industry within the country. The respondents (A/E consulting companies), have been dealing with several classes of Saudi contractors. The respondents were asked to identify the class of the construction companies that they assess as part of the questionnaire survey. Table 4.3 presents the numbers and percentages of construction companies that were assessed by the respondents. The percentages for classes 1, 2, and 3 are 60%, 22%, and 18% respectively.

Table 4. 3 Classification of contractors who are included in the data collected

Contractor's Classifications	Number of respondents per class	% of respondents per class
Class 1	30	60.0%
Class 2	11	22.0%
Class 3	9	18.0%
Overall	**50**	**100%**

4.3 Quality Services Gaps

Service quality is a multidimensional structure composed of differences between the perception (P) and expectation (E) (Al-Saggaf, 1999) (Badri, et al, 2005).

As discussed in chapter Three, SERVQUAL gaps have been used to assess the quality service features in the Saudi construction industry from the respondents' point view, therefore service quality gaps will be measured for each specific service by the formula (4.1), and (4.2) (Jun and He, 2007):

$$SQ_i = P_i - E_i \quad (4.1)$$

Where:

SQ: scores of perception of service quality (gap).

Pi: score of perception of service i.

Ei: score of expectation of service i.

$$AVSQ = \frac{\sum_{i=1}^{N} SQ_i}{N} \quad (4.2)$$

Where:

AVSQ: average score of service quality.

SQi: scores of perception of quality service for service i.

N: total number questionnaires.

By using the two formulas, the evaluation gaps in contractors' service quality can be calculated. The range of the resultant quality service gaps for SERVQUAL calculation is (-6 to +6). Gap scores of -6; means that the respondent expected higher level of quality service than he received with 6 scales of 7 scale base, while the gap score of +6; means that the respondent received a higher level of quality service than he expected with 6 scales of 7 scale base. The score zero for the service means that the expectation and perception scores for that item are the same. The negative value of the score represents the perception that scores less than the expectation, while the positive value imply higher score for the perception than in the expectation. If the participant came closer to reach his proposed expectation, the gap score will be lower.

Table 4. 4 The expectations and perceptions for each service and related gaps

No.	Item description	E	P	SQ (Gap)
1	Modern equipment	5.31	3.96	-1.35
2	Providence physical facilities	5.49	3.80	-1.69
3	Neatness appearance	5.71	4.00	-1.71
4	Providence the visually appealing materials	5.53	3.86	-1.67
5	Solving problems sincerely	5.43	3.41	-2.02
6	Completing the task on time	5.67	3.94	-1.73
7	Performance on the first try correctly	5.29	3.41	-1.88
8	Providence as they promise	5.10	3.43	-1.67
9	Error-free records	5.14	3.43	-1.71
10	Keeping to schedule	5.41	3.57	-1.84
11	Prompt service	5.49	3.94	-1.55
12	Willing to help	5.22	4.06	-1.16
13	Never too busy to respond	5.27	3.82	-1.45
14	Instill confidence in customers	5.45	4.18	-1.27
15	Customers feel safe	5.49	4.16	-1.33
16	Courtesy to customers	5.84	4.88	-0.96
17	Ability to answer customers' questions	5.61	4.02	-1.59
18	Giving customers individual attention	5.06	3.78	-1.27

19	Having convenient operating hours	5.76	4.02	-1.75
20	Employees give customers personal attention	4.82	3.59	-1.24
21	Having customers' best interests at heart	4.88	3.55	-1.33
22	Understanding the specific needs of customers	5.06	3.94	-1.12
	Mean	**5.37**	**3.85**	**-1.51**

The table 4.4 shows the calculations of SERVQUAL scores (Gap 5) for all the 22 services. The mean average for the expectations and perceptions for the whole items are 5.37, and 3.85 respectively from 7 score scale. The average of the overall gaps between the quality services is -1.51

Table 4. 5 The expectations and perceptions for tangible items and related gaps

No	Item description		E	P	SQ (Gap)
1	**Tangibles.**	Modern equipment	5.31	3.96	-1.35
2		Providence physical facilities	5.49	3.80	-1.69
3		Neatness appearance	5.71	4.00	-1.71
4		Providence the visually appealing materials	5.53	3.86	-1.67
Mean			5.51	3.91	-1.60

Table 4.5 presents quality service gaps for the tangible items (4 items). As can be seen in Table 4.5, the highest gap value of the tangible items (-1.71) is the neat

appearance (such as clean, tidy and use of PPE: Personal Protection Equipment). It can also be seen in that table that the difference between the highest and the lowest gaps (modern equipment) is considered small. The mean calculated for the overall items within tangible service items is (-1.60).

Table 4. 6 The expectations and perceptions for reliability items and related gaps

No.	Item description		E	P	SQ (Gap)
5	Reliability	Solving problems sincerely	5.43	3.41	-2.02
6		Completing the task on time	5.67	3.94	-1.73
7		Performance on the first try correctly	5.29	3.41	-1.88
8		Providence as they promise	5.10	3.43	-1.67
9		Error-free records	5.14	3.43	-1.71
Mean			5.33	3.59	-1.74

Table 4.6 shows the difference between the expectations and perceptions for reliability criteria. The mean of the differences in this group is (-1.74). The bigger and smaller amounts of gaps are -2.02 and -1.67 respectively. Solving problems sincerely gap has the biggest value of the respondents point of view, while the smallest value was error-free records item. It is noticeable that the gaps in the second group of items under the dimension of reliability have a considerable difference between the highest and the lowest (i.e. -2.07, - 1.22).

Table 4. 7 The expectations and perceptions for responsiveness items and related gaps

No.	Item description		E	P	SQ (Gap)
10	Responsiveness	Keeping to schedule	5.41	3.57	-1.84
11		Prompt service	5.49	3.94	-1.55
12		Willing to help	5.22	4.06	-1.16
13		Never too busy to respond	5.27	3.82	-1.45
Mean			5.35	3.85	-1.50

Table 4.7 shows the SERVQUAL score calculations correlated to the responsiveness items. The items of this dimension discuss the level, which the contractors deal with consultants' demands and complaints effectively and immediately. The mean for the items is -1.50. The most critical item is that the contractors do not strict exactly when the services will be performed (not following the agreed/approved schedule). The respondents see that the lowest gap in this dimension associated with willingness to help from the contractors' employees (-1.16).

Table 4. 8 The expectations and perceptions for assurance items and related gaps

No.	Item description		E	P	SQ (Gap)
14	Assurance.	Instill confidence in customers	5.45	4.18	-1.27
15		Customers feel safe	5.49	4.16	-1.33
16		Courtesy to customers	5.84	4.88	-0.96
17		Ability to answer customers' questions	5.61	4.02	-1.59
Mean			5.60	4.31	-1.29

The gaps for the assurance items are depicted through the table 4.8. They contributed with the lowest mean, among the whole dimensions (-1.29). Confidence, trust and knowledge are the main questions beyond those types of quality services. From that type of services, knowledge and feeling safe with the employees of the contractors was the first two problems from the perspective of the consultants and A/E's (-1.59 and -1.33 respectively). Only courtesy and polite have the least criticality gaps in Assurance items. In this dimension, which has the lowest gap value between the whole 22 survey services.

Table 4. 9 The expectations and perceptions for empathy items and related gaps

No.	Item description		E	P	SQ (Gap)
18	Empathy	Giving customers individual attention	5.06	3.78	-1.27
19		Having convenient operating hours	5.76	4.02	-1.75
20		Employees give customers personal attention	4.82	3.59	-1.24
21		Having customers' best interests at heart	4.88	3.55	-1.33
22		Understanding the specific needs of customers	5.06	3.94	-1.12
Mean			5.12	3.78	-1.34

The five criteria shown in table 4.9 represent the empathy dimension in the questionnaire of this quality services survey. -1.34 is the empathy dimension mean. The highest gap value is related to the service, whether the contractors have operating hours meeting the client's requirement and project constraints (with a gap value -1.75). The lowest gap value is for Understanding the specific needs of customers with a gap value of -1.12.

4.4 Gaps on the Quality Dimensions

Table 4.10 summarizes the quality service gaps at the dimension levels, i.e. tangible, reliability, responsiveness, assurance, and empathy the contractor's performance in assurance was rated as the best dimension among the others. Assurance has the lowest gap mean (-1.29). Therefore, rather than focusing on enhancing assurance, reliability dimension may have the priority to be the issue of enhancing the overall construction

quality services due to the resultant difference of the gap. The overall mean of the service gaps is -1.49.

Table 4. 10 The expectations and perceptions of the whole dimensions and related gaps

Dimension	E	P	SQ (Gap)
Tangibles. Items (1-4)	5.51	3.91	-1.60
Reliability. Items (5-9)	5.33	3.59	-1.74
Responsiveness. Items (10-13)	5.35	3.85	-1.50
Assurance. Items (14-17)	5.60	4.31	-1.29
Empathy. Items (18-22)	5.12	3.78	-1.34
Mean	5.38	3.89	-1.49

As shown in table 4.10. The scores of SERVQUAL gaps are estimated for the dimensions of the service quality items has been assessed. Figure 4.1 indicates that the Saudi construction industry has a bigger problem with reliability. As the SERVQUAL scores for the dimensions, the highest average between the dimensions is -1.74. The second dimension, which considered next to reliability dimension is tangible items (-1.60).

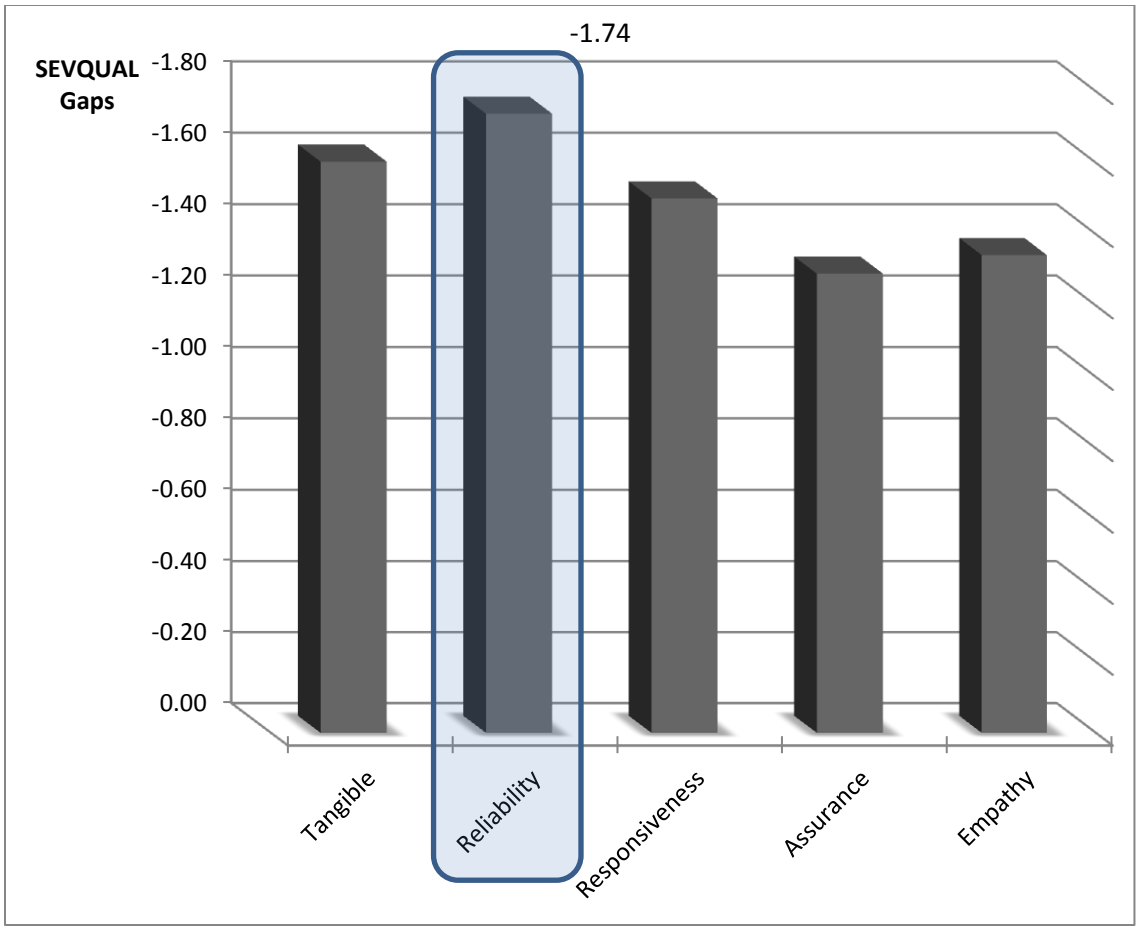


Figure 4. 1 Shows the SERVQUAL gaps for the whole Dimensions and the highest gap between them

Significance test (T- test)

Based on the T- test which is conducted between the expectations and perceptions for each dimension, in order to know if the difference between them are significant or not. The analysis of this test is based on the following hypothesis:

Ho = The means of the expectations and perceptions for each dimension are equal.

Ha = The means of the expectations and perceptions for each dimension are not equal.

Table 4. 11 shows T- test of the expectations and perceptions for each dimension

		Paired Differences				t	df	Sig. (2 tailed)
		Mean	Std. Deviation	95% Confidence Interval				
				Lower	Upper			
Pair 1	Tangible E Tangible P	1.625	1.393	1.23	2.02	8.25	49	0.00
Pair 2	Reliability E Reliability P	1.756	1.438	1.35	2.17	8.63	49	0.000
Pair 3	Responsiveness E Responsiveness P	1.522	1.525	1.09	1.96	7.06	49	0.000
Pair 4	Assurance E Assurance P	1.295	1.553	.85	1.74	5.90	49	0.000
Pair 5	Empathy E Empathy P	1.336	1.408	.94	1.74	6.71	49	0.000

Based on the T- test, as indicated in table (4.11), it is noticeable that the null hypothesis is rejected for the whole dimensions because the significant value is less than 0.05. That means the means of the expectations and perceptions for each dimension are not equal. Because of that, there are significant gaps between them.

4.5 Ranking the quality services

According to the responses from 50 engineers who work in Saudi construction consultants or A/E's firms, table 4.11 reports the means of their expectations as well as the perceptions of each item. SERVQUAL gap has been assessed as a result of the subtraction of the two columns of means as indicated in the table 4.11, then they have been ranked in ascending order.

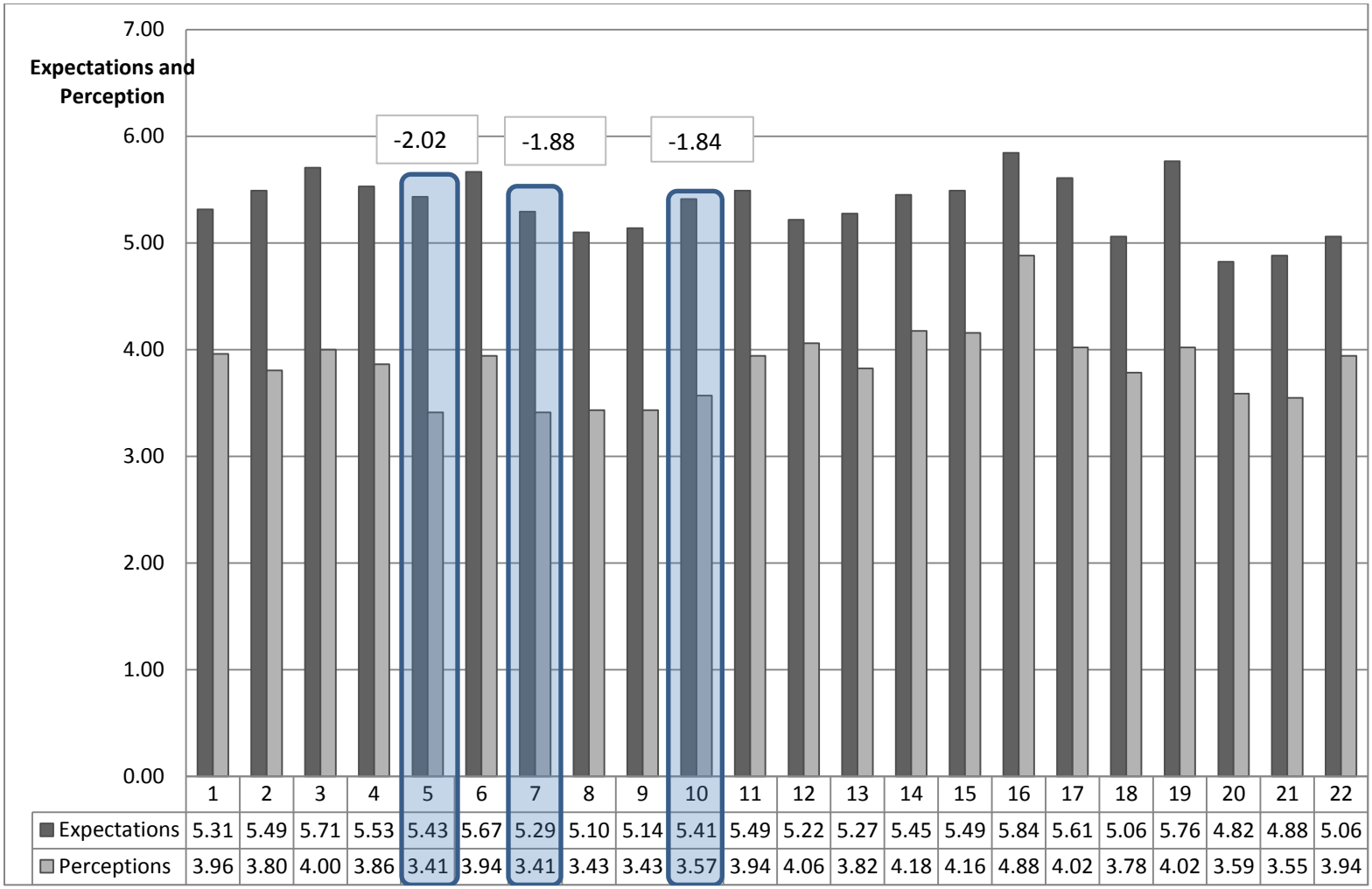
Table 4. 12 Raking the 22 quality services from the highest to the lowest gap

Ranking Sequence	Item No.	Dimension	Item description	SQ (Gap)
1	5	Reliability	Solving problems sincerely	-2.02
2	7	Reliability	Performance on the first try correctly	-1.88
3	10	Responsiveness	Keeping to schedule	-1.84
4	19	Empathy	Having convenient operating hours	-1.75
5	6	Reliability	Completing the task on time	-1.73
6	9	Reliability	Error-free records	-1.71
7	3	Tangibles	Neatness appearance	-1.71
8	2	Tangibles	Providence physical facilities	-1.69
9	4	Tangibles	Providence the visually appealing materials	-1.67
10	8	Reliability	Providence as they promise	-1.67
11	17	Assurance	Ability to answer customers' questions	-1.59
12	11	Responsiveness	Prompt service	-1.55
13	13	Responsiveness	Never too busy to respond	-1.45
14	1	Tangibles	Modern equipment	-1.35
15	21	Empathy	Having customers' best interests at heart	-1.33
16	15	Assurance	Customers feel safe	-1.33
17	14	Assurance	Instill confidence in customers	-1.27
18	18	Empathy	Giving customers individual attention	-1.27

19	20	Empathy	Employees give customers personal attention	-1.24
20	12	Responsiveness	Willing to help	-1.16
21	22	Empathy	Understanding the specific needs of customers	-1.12
22	16	Assurance	Courtesy to customers	-0.96

Table 4.11 Raking the 22 quality services from the highest to the lowest gap (continued)

The order in the table 4.11 from the most critical to the least critical item regarding the A/E's perspectives. It is remarkable that reliability services have occupied the highest ranks of gaps between the whole quality services have been ranked.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Expectations	5.31	5.49	5.71	5.53	5.43	5.67	5.29	5.10	5.14	5.41	5.49	5.22	5.27	5.45	5.49	5.84	5.61	5.06	5.76	4.82	4.88	5.06
Perceptions	3.96	3.80	4.00	3.86	3.41	3.94	3.41	3.43	3.43	3.57	3.94	4.06	3.82	4.18	4.16	4.88	4.02	3.78	4.02	3.59	3.55	3.94

Figure 4. 2 Shows the expectations and perceptions for the whole items and the 3 highest gaps among them

Judging from the ranking table for the whole items and the figure 4.2, it is noteworthy that the first three critical problems which have the highest SERVQUAL gaps were; firstly with a gap of -2.02, Solving problems sincerely from the contractor side. They see that the problem of following the schedule by the contractor side in the construction projects is becoming the next second problem, with a gap value of -1.88. The second gap value is close to the third gap from the ranking, which is -1.82. The third item arguing that the contractor does not perform the service right the first time within the project.

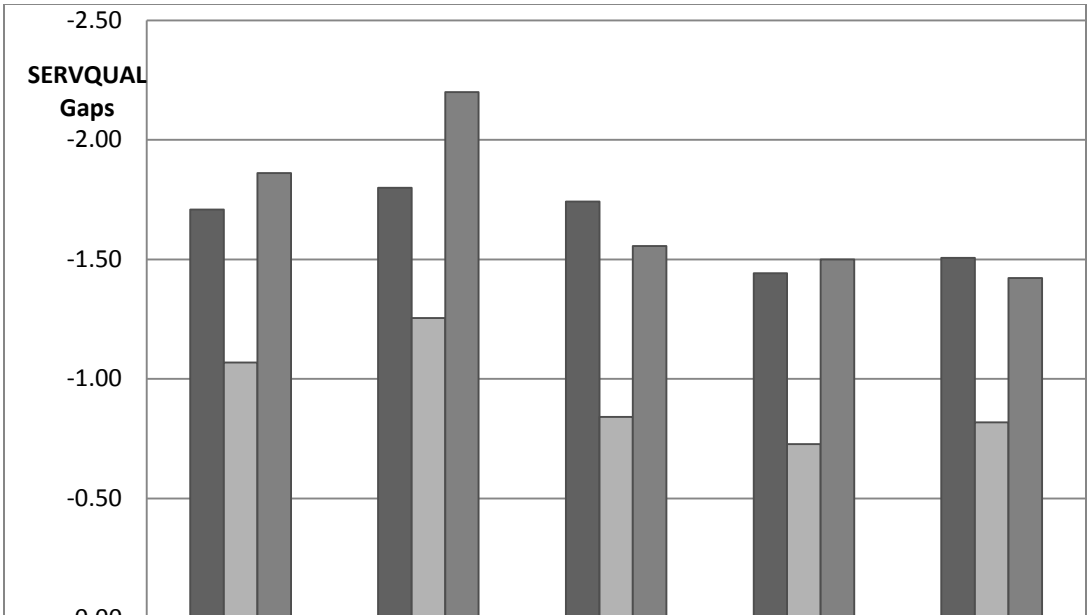
The majority of the high ranked critical problems is mainly for reliability and tangible dimensions, while the plurality of lower ranked items comes from empathy and assurance dimensions; the lowest problem from the whole list is talking about the contractors' courtesy and polite to customers.

4.6 Quality Gaps across contractors classes

The services dimensions differ across the classification of contractors have been assessed. Table 4.12 and figure 4.3 show the average of the dimensions' gaps in each class type (class 1, 2 and 3).

Table 4. 13 The dimensions' gaps per each class of contractors and overall mean for the classes

Class type	Tangible Gap	Reliability Gap	Responsiveness Gap	Assurance Gap	Empathy Gap	Mean
Class 1	-1.71	-1.80	-1.74	-1.44	-1.51	-1.64
Class 2	-1.07	-1.26	-0.84	-0.73	-0.82	-0.94
Class 3	-1.86	-2.20	-1.56	-1.50	-1.42	-1.71



	Tangible	Reliability	Responsiveness	Assurance	Empathy
Class 1	-1.71	-1.80	-1.74	-1.44	-1.51
Class 2	-1.07	-1.26	-0.84	-0.73	-0.82
Class 3	-1.86	-2.20	-1.56	-1.50	-1.42

Figure 4. 3 shows the diversity of SERVQUAL gaps per classes of contractors

The highest shortfall of service dimensions average (-1.71) occurred within the contractors of class 3. Class 1 has also a similar high average of service gaps (-1.64). On the other hand, the least gap among the classes of contractors was for the class 2 contractors with a mean of -0.94.

4.7 Quality Gaps across the experience

The range of respondents' experience has a valuable insight on the quality services of the construction companies. Due to the difference in, Table 4.15 explores the variation of quality services dimensions' gaps for the participants' groups, including the

expectations and perceptions of the respondents. The responses are divided based on the experiences' groups of 1-5, 5-10 and more than 10 years.

Table 4. 14 The Dimensions' gaps per each experience's range of the participants

Experience (Years)	Tangibles		Reliability		Responsiveness		Assurance		Empathy		Average of expectations	Average of perceptions	GAP
	E	P	E	P	E	P	E	P	E	P			
1-5	5.63	3.75	5.40	3.40	5.54	3.77	5.80	4.27	5.40	3.79	5.55	3.79	-1.76
5-10	5.31	4.33	5.38	4.14	5.12	4.27	5.27	4.77	4.82	4.08	5.18	4.32	-0.86
>10	4.82	3.97	4.69	3.54	4.63	3.78	4.88	4.32	4.41	3.75	4.69	3.87	-0.82

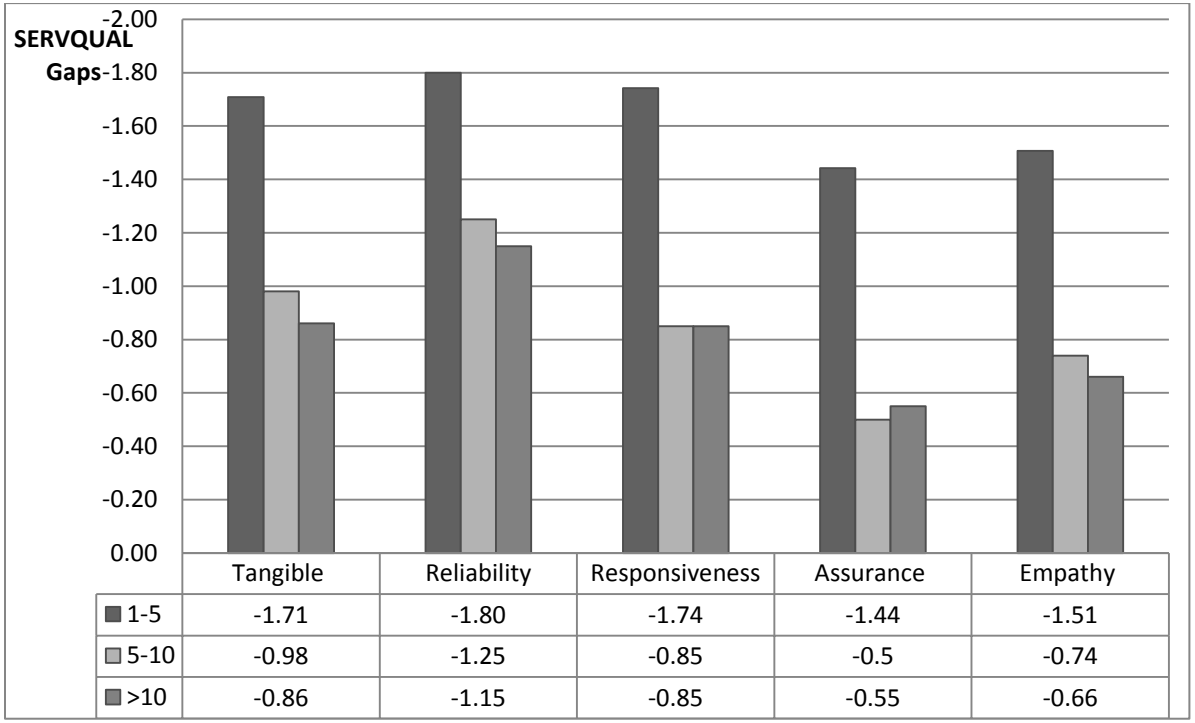


Figure 4. 4 shows the diversity of SERVQUAL gaps per experience's range of the participants

It can be seen from Table 4.13 and Figure 4.4 that the difference between the highest and lowest gaps is around (1.02). It is interesting to see that the group who has less experience (1-5 years), score the highest in the quality service gaps. The more experience groups (5-10 and more than 10 years), on the other hand, give lower SERVQUAL scores for the quality services. The scores for expectations (E) and Perceptions (P) indicate that the lower quality service gaps have resulted from the combination of decreasing expectation and increasing perception.

4.8 Discussion

By the results' analysis drawn in this chapter, the following discussion ideas are summarizing these study findings according to the following titles:

Quality Services Gaps

The study determined the most critical problems of quality services in Saudi construction industry by distributing a questionnaire. The sample size is 50 respondents from A/E's consulting firms working in Saudi Arabia. They have mainly job size of 50 million riyals or higher.

The study demonstrated that there are quality service problems based on the resultant gaps from the SERVQUAL tool. Figure 4.5 shows the most critical dimensions on the two dimensional Differencing Plane. The quality dimensions located in the upper left quadrant, have the most significant problems among the other dimensions' gaps (Foster, 2010). This case depicts high scale of expectations for particular quality services dimension, yet the perceptions of them are currently low.

From the analysis presented in this chapter, in particular in table 4.11 and figure 4.2, it can be seen that the most significant gaps occur on quality service dimension related to reliability (includes: solving problems sincerely, completing the task on time, performance on the first try correctly, providence as they promise, and error-free records). These results show similarities with the study done Bubshaiat. et al. (1999), who indicate the main problem for the quality service; work relationship, employee training and education, performance quality audit and design code establishment.

According to the previous studies, which have assessed the quality services in construction industries in several countries around the world, using SERVQUAL tool, it shown in table (4.15), the common gaps between the previous studies and the results of this study in KSA. Reliability dimension has the highest gap between the findings of the previous studies.

Table 4. 15 Shows quality service gaps of the previous studies around the world.

Author	Years	Country	Findings (Quality service gaps)
Siu et al	2001	Australia	Reliability dimension.
Ling and Chong	2004	Singapore	Reliability dimension. Resolve the work conflicts. Share the common goals.
Lai and Pang	2010	Hong Kong	Providing at the time they promise. The required documents.
Proverbs and Oduoza	2006	UK	Efficient communications.
Ismail et al	2010	Malysia	Reliability dimension.

Ranking the quality services

The study identified the most critical gaps among the 22 items, and then ranked them based on their severity. The respondents considered the first three items regarding to their gap values in the ranking list of services are; solving problems sincerely, performance on the first try correctly, and keeping to schedule.

The least critical service dimension of the gap analysis, which has been evaluated are assurance dimension includes: instill confidence in customers, customers feel safe, courtesy to customers, and ability to answer customers' questions.

It is also found that, among the three classes of contractors (Class 1, 2 & 3), Class 3, and 1 contractors have the highest quality service gaps respectively. One good explanation for this case would be the massive amount of construction project they are carrying without appropriate and sufficient management.

Quality Awareness

The study also analyzed the influence of experience of the respondents in their assessment of the contractors' quality services. It is found that the engineers who have less experience (number of years) in KSA, identify higher quality problems. When they gain more experience working in KSA, they tend to see lower quality service gaps. One possible explanation for this condition is that the high expectations for the new engineers who start working in KSA. When they gain more experience, they would recognize the nature of the construction market, which could lead to lower expectations of quality services. Another possible explanation is that the quality services in the KSA construction market have in fact improved.

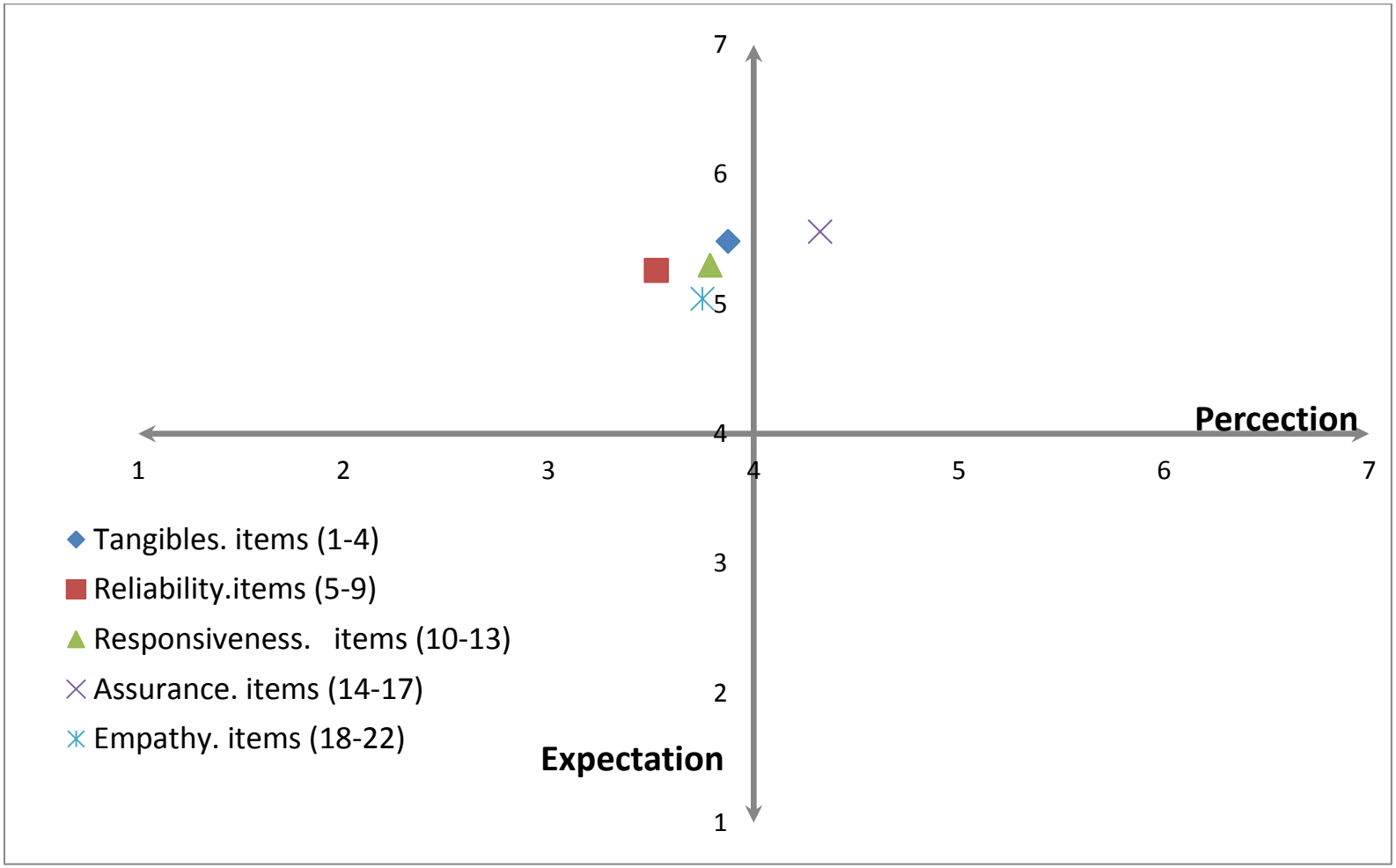


Figure 4. 5 Two-Dimensional Differencing Plane

CHAPTER 5

CONCLUSION

5.1 Conclusion

This research aimed to investigate the level of A/E's awareness of construction project's quality of Saudi Arabian construction performance. Following the analysis and discussion of the questionnaire survey results, it can be concluded:

- There are considerable quality service problems (gaps) that affect the overall performance of the construction projects in Saudi Arabia from the perspective of Architectural/Engineering (A/E) consulting companies. The main quality problems are related to the reliability and tangible dimensions.
- Solving problems sincerely, performance on the first try correctly, keeping to schedule, and having convenient operating hours are considered the most significant problems with the quality services of construction contractors in KSA.
- The service quality grapes for the class 3 contractors are higher than class 1 and 3 contractors.
- There is a reverse relation between the range of experience working in KSA and the service quality gaps resultants. Engineers with high experience range, identify lower gaps than the lower experience ones.This

indicates that the A/Es who works in construction projects in KSA do have an awareness of quality service problems in the construction market in KSA.

5.2 General Recommendations

The following points are recommended for resultants' quality problems. These implications, if it is followed, it will enhance the quality of the contractors' performance, and also for the whole construction industry of Saudi Arabia:

- Understanding the needs process is the first step towards reaching to the service quality improvement in the construction industry as general.
- Due to the lack of contractor employees' technical quality, it should be awarded to enhance their technical quality aspects.
- Implementing strict timetable schedule for the construction projects.
- Manage and speed up in solving the problems and complaints raised through the works.
- Physical facilities in the projects are necessary to be checked and evaluated before using in the construction projects.
- The whole contractors' staff has to professionally chosen, training and short courses should be provided for each level of employee.
- One interviewer highlighted the importance of doing a feasibility study at the early stages of the construction projects, he referred the majority of time schedule problems for the cash flow stability from the contractors and owner to the project.

5.3 Limitations

- More responses to that questionnaire mean more comprehensive views of the entire Saudi construction quality services. The ratio of responses was small 30% (63 responses from 200 distributed).
- Some of the respondents were sensitive to some types of questions; like those talking about personal attention.

5.4 Further Studies

- Future researches may be oriented to study the other quality gap types (1-4) and its effects on Saudi construction projects.
- Further researches might try to check whether there are extra services than the 22 identified in the questionnaire need to be evaluated for Saudi conditions.
- The changing on the entire quality services in Saudi Arabia construction industry over the years, by making relations between the participants' perceptions and years of experience.
- Further study might take the perspectives of the Saudi owner instead of Architectural/Engineering (A/E) consulting companies, then compare the results.
- The quality of construction products (i.e. Construction projects) might be field of following researches over than studying quality services.

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Appendix

Research questionnaire survey (Page 1/3)

Dear participant,

This survey will be used as a part of a master thesis in King Fahd University for Petroleum and Minerals (KFUPM), the collected information is for research purpose only.

The aim of this study is to identify and prioritize the Quality service problems that affect the performance of the construction projects in Saudi Arabia based on (A/E) consulting perspective. In order to achieve those aims, this survey will gather information about the expectations and perceptions about quality services in KSA construction.

The body of survey consists of two parts, the first part is general information about the respondent. The second part assesses the difference between the expected and perceived construction quality services in KSA provided by the contractors to the clients or their representatives.

Your contribution in this regard is highly appreciated.

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Research questionnaire survey (Page 2/3)

Part 1: General information
Firm's name:
Projects Type ◯ Building ◯ Engineering (Highways, etc.) ◯ Industrial (Power plants, refineries) ◯ Others (please specify)
Average job size (Million of Saudi Riyals) ◯ Less than one ◯ 1-10 ◯ 10-50 ◯ More than 50
Classifications of typical contractors You are working with: ◯ Class 1 ◯ Class 2 ◯ Class 3 ◯ Class 4 ◯ Class 5
Respondent's name (Optional) :
Position:
Experience / years :
Experience in KSA / years :
Nationality (Optional):
Respondent's E-mail :
Respondent's Fax: Mobile phone :

Research questionnaire survey (Page 3/3)

Part 2: Construction quality services

Note: 1) ***The expectation column*** represents your expectations about saudi contractors' quality services :

2) ***The Perceptions column*** represents your opinion about the actual saudi contractors' quality services :

#	Item description		***Expectations*** St. Disagree 1 2 3 4 5 6 7 St. Agree	***Perceptions*** St. Disagree 1 2 3 4 5 6 7 St. Agree
1	Tangibles	Contractors have modern-looking equipment.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
2		Physical facilities of contractors are visually appealing (such as workshops, Storages, Offices and warehouses).	1 2 3 4 5 6 7	1 2 3 4 5 6 7
3		Contractors' employees are neat-appearing (such as Clean, tidy and use of PPE : Personal Protection Equipments).	1 2 3 4 5 6 7	1 2 3 4 5 6 7
4		Materials associated with the service (such as Computers, software and system) are visually appealing at contractors	1 2 3 4 5 6 7	1 2 3 4 5 6 7
5	Reliability	When the cotractor promises to do something by a certain time, he does so (completing the task on time).	1 2 3 4 5 6 7	1 2 3 4 5 6 7
6		When you have a problem, the contractor shows a sincere interest in solving it.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
7		The contractor performs the service right the first time.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
8		The contractor provides his services at the time he promises to do so.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
9		The contractor insists on error-free records	1 2 3 4 5 6 7	1 2 3 4 5 6 7
10	Responsiveness	Employees of the contractors tell you exactly when services will be performed (ie. follow the agreed/approved schedule).	1 2 3 4 5 6 7	1 2 3 4 5 6 7
11		Employees of the contractor give you prompt service.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
12		Employees of the contractor are always willing to help you.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
13		Employees of the contractor are never too busy to respond to your requests.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
14	Assurance	The behavior of contractor's employees instills confidence in you.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
15		You feel safe in your transactions with the contractors	1 2 3 4 5 6 7	1 2 3 4 5 6 7
16		Employees of the contractor are consistently courteous (polite) with you.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
17		Employees of the contractor have the knowledge to answer your questions.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
18	Empathy	The contractor gives you individual attention (to your project).	1 2 3 4 5 6 7	1 2 3 4 5 6 7
19		The contractor has operating hours that meet client requirement and project constraint	1 2 3 4 5 6 7	1 2 3 4 5 6 7
20		The contractor has employees who give you personal attention.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
21		The contractor has your best interests at heart.	1 2 3 4 5 6 7	1 2 3 4 5 6 7
22		Employees of the contractor understand your specific needs.	1 2 3 4 5 6 7	1 2 3 4 5 6 7

Questionnaire responses (Page 1/5)

Quality services	Questionnaire no.																			
	1		2		3		4		5		6		7		8		9		10	
	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P
1	5	3	3	3	7	5	5	5	5	4	5	5	5	4	6	7	7	4	6	3
2	3	5	3	5	5	7	5	5	4	6	5	6	4	5	7	6	4	7	3	6
3	5	3	4	3	7	5	5	4	6	5	6	4	5	5	6	5	7	2	6	3
4	3	6	4	6	5	7	4	4	5	6	4	6	5	4	5	6	2	7	3	6
5	6	4	3	4	7	4	4	5	6	6	6	5	4	5	6	5	7	3	6	3
6	4	5	3	5	4	7	5	5	6	7	5	5	5	6	5	5	3	7	3	6
7	4	3	3	3	7	6	5	5	6	5	5	4	3	6	4	5	7	3	6	3
8	3	4	4	4	6	7	5	4	5	6	5	5	3	4	2	2	4	7	3	6
9	4	3	5	3	7	5	5	6	5	5	4	4	4	2	4	2	7	4	5	4
10	2	5	4	5	6	7	6	5	4	7	5	5	3	4	2	4	4	7	3	5
11	5	4	4	4	7	6	5	6	6	5	2	6	4	4	4	2	7	5	5	4
12	5	4	4	4	5	7	5	5	6	6	3	5	4	3	5	4	4	7	4	6
13	4	3	2	3	7	6	6	5	6	5	4	5	5	3	5	2	7	4	6	3
14	3	4	2	4	5	7	5	5	4	5	5	4	3	4	5	4	4	7	3	5
15	4	2	6	2	7	6	5	6	5	4	4	5	5	3	5	2	7	4	5	3
16	3	5	6	5	4	7	4	5	5	6	3	2	5	4	4	4	6	7	4	5
18	4	5	3	5	7	5	6	5	5	6	5	3	4	4	5	5	7	4	6	4
19	3	4	3	4	5	7	5	6	5	6	6	4	4	5	5	5	5	7	4	6
20	4	3	5	3	7	5	5	5	6	4	4	5	4	3	4	5	7	4	6	3
21	3	4	5	4	5	7	4	5	5	5	5	4	3	5	3	5	4	7	3	5
22	4	3	4	3	7	4	6	4	7	5	6	3	4	5	5		7	6	6	4

Questionnaire responses (Page 2/5)

Quality services	Questionnaire no.																			
	11		12		13		14		15		16		17		18		19		20	
	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P
1	7	5	7	4	5	5	6	3	7	5	7	4	5	4	5	2	4	4	3	4
2	7	2	7	2	6	5	6	1	7	6	7	2	2	5	5	3	5	4	3	3
3	7	1	7	3	6	2	6	2	7	6	7	3	7	3	5	5	4	3	5	6
4	7	1	7	3	6	2	6	2	7	6	7	3	6	3	5	4	3	3	3	5
5	7	1	7	4	6	2	6	2	7	4	7	4	7	2	5	4	5	4	4	5
6	7	1	7	3	6	3	6	2	7	7	7	5	6	3	5	1	4	3	6	6
7	7	1	7	5	6	3	6	1	7	5	7	4	7	3	5	1	3	4	6	5
8	7	1	7	4	6	4	6	2	7	5	7	4	7	3	5	2	3	4	4	3
9	7	1	7	4	6	3	6	2	7	7	7	4	6	4	5	2	3	5	4	4
10	7	1	7	4	6	2	6	2	7	5	7	4	6	3	5	2	4	5	5	3
11	7	1	7	3	6	3	6	2	7	4	7	5	7	6	5	2	4	6	5	4
12	7	1	7	3	6	2	6	2	7	4	7	4	7	4	5	4	5	6	3	3
13	7	1	7	2	6	2	6	3	7	7	7	4	7	5	5	4	6	5	2	5
14	7	1	7	3	6	4	6	3	7	7	7	5	6	6	5	3	6	4	4	4
15	7	1	7	2	6	2	6	3	7	7	7	7	7	6	5	4	7	4	3	6
16	7	1	7	3	6	3	6	1	7	6	7	4	7	6	5	3	6	3	7	7
18	7	1	7	2	6	3	7	2	7	7	7	4	7	5	5	4	6	3	5	4
19	4	1	7	1	6	3	6	2	7	7	7	7	6	3	5	3	5	4	5	3
20	7	1	7	3	6	2	6	2	7	4	7	5	7	2	5	3	5	3	6	4
21	3	1	7	2	6	3	6	2	4	4	7	4	7	5	5	3	4	4	3	5
22	3	1	7	2	6	3	7	2	4	4	7	4	6	5	5	3	4	4	5	5

Questionnaire responses (Page 3/5)

Quality services	Questionnaire no.																			
	21		22		23		24		25		26		27		28		29		30	
	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P
1	4	3	4	3	4	4	5	1	5	3	7	6	6	5	7	6	7	3	5	6
2	4	3	5	3	4	4	6	1	5	4	6	6	6	4	7	6	7	5	4	6
3	5	4	6	2	3	3	5	2	6	5	7	5	7	5	7	5	7	4	3	5
4	5	4	4	4	4	4	4	2	6	3	7	6	6	4	6	5	7	3	4	6
5	5	4	6	2	3	2	2	1	6	4	7	6	6	4	7	5	7	2	3	4
6	4	4	4	3	4	4	5	1	6	4	6	6	7	4	7	6	7	1	4	6
7	4	3	1	1	3	3	6	1	6	3	7	5	6	4	7	6	7	3	5	5
8	4	3	1	1	2	2	6	1	5	4	7	5	6	4	7	6	7	3	3	4
9	2	4	2	3	4	4	4	2	6	4	6	5	7	5	7	6	7	4	5	6
10	4	4	2	1	2	1	4	3	7	6	7	5	6	6	7	5	7	4	4	6
11	4	4	3	3	4	4	3	2	6	5	6	6	6	5	7	6	7	1	3	6
12	4	4	1	1	4	4	2	2	6	5	7	6	6	4	7	7	7	1	5	4
13	4	4	1	1	4	4	3	3	5	4	7	6	7	4	7	7	7	3	5	5
14	4	4	6	4	4	4	4	4	6	3	6	5	7	4	6	5	7	6	5	5
15	5	5	4	4	4	4	4	2	6	5	7	6	7	3	6	6	7	4	2	4
16	6	6	4	4	3	3	4	3	6	6	7	7	7	6	7	6	7	6	4	6
18	5	3	6	2	2	2	4	2	6	5	6	5	6	4	7	7	7	2	3	6
19	3	3	1	1	2	2	4	2	5	4	6	5	6	5	6	6	7	1	4	5
20	3	2	4	4	4	4	5	2	7	5	7	6	6	4	7	6	7	4	4	5
21	3	2	1	1	1	1	3	1	5	3	6	7	7	5	7	6	7	1	5	5
22	3	2	1	1	1	1	3	2	4	3	7	6	6	4	7	5	7	5	3	4

Questionnaire responses (Page 4/5)

Quality services	Questionnaire no.																			
	31		32		33		34		35		36		37		38		39		40	
	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P
1	7	6	6	4	6	4	6	3	5	5	5	2	6	5	5	5	6	2	4	4
2	6	5	6	5	6	4	6	4	5	5	5	1	6	5	6	5	6	2	7	4
3	7	6	6	5	6	6	6	4	6	5	6	2	6	5	5	4	6	2	7	5
4	6	6	4	4	6	5	6	6	6	5	5	2	6	4	5	5	6	3	7	4
5	7	5	6	3	6	3	6	6	6	5	6	1	7	3	6	3	6	4	7	4
6	7	6	5	5	7	5	6	3	6	4	5	2	7	4	6	3	6	2	7	5
7	7	5	5	3	7	6	6	3	6	5	5	3	7	4	6	2	6	2	7	4
8	7	5	5	4	6	3	6	4	6	5	5	2	7	3	5	4	6	3	7	7
9	7	5	5	3	6	4	6	4	6	5	5	4	6	4	6	5	6	2	7	1
10	7	5	5	4	7	6	6	3	6	5	6	2	7	3	6	4	6	2	7	4
11	7	6	6	4	6	5	6	3	6	6	7	2	7	3	6	3	6	2	7	4
12	7	5	5	5	7	6	6	3	6	6	5	2	7	4	5	5	6	2	1	7
13	7	5	5	4	6	5	6	4	6	5	6	1	6	3	6	6	6	2	4	7
14	7	5	6	4	7	5	6	4	6	5	5	1	7	4	6	6	6	2	1	7
15	7	4	6	4	6	4	6	4	6	6	6	2	6	4	6	4	6	2	4	7
16	7	6	5	5	7	6	6	3	6	6	7	1	6	4	6	5	6	2	7	7
18	7	6	5	4	7	6	6	3	6	5	5	2	7	3	5	4	6	2	4	4
19	7	6	6	4	6	5	6	3	6	6	5	1	6	3	6	4	6	2	4	4
20	7	6	6	5	7	6	6	3	6	5	5	1	7	3	6	6	6	2	4	6
21	1	3	6	5	5	3	6	4	6	5	5	2	6	4	5	4	6	2	4	4
22	7	1	5	4	5	3	6	3	6	5	7	2	4	4	6	6	6	2	4	6

Questionnaire responses (Page 5/5)

Quality services	Questionnaire no.																				AV. E	AV. P	Gap
	41		42		43		44		45		46		47		48		49		50				
	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P			
1	7	5	6	5	5	4	5	2	3	2	6	5	3	5	5	3	3	3	5	3	5.31	3.96	-1.35
2	6	4	4	3	6	2	5	1	3	2	6	5	4	4	6	4	6	6	5	4	5.49	3.80	-1.69
3	5	3	6	4	5	3	4	1	5	5	4	4	5	2	7	4	6	7	6	6	5.71	4.00	-1.71
4	6	4	7	4	4	3	4	1	5	3	6	6	5	2	6	2	6	4	5	4	5.53	3.86	-1.67
5	6	3	5	5	3	3	5	1	3	1	6	6	5	1	6	2	3	2	6	4	5.43	3.41	-2.02
6	6	4	6	4	5	1	5	3	7	7	5	5	3	1	5	4	6	4	5	5	5.67	3.94	-1.73
7	6	4	6	5	4	1	4	1	2	1	5	6	1	1	3	2	4	4	5	3	5.29	3.41	-1.88
8	6	4	6	5	5	2	4	1	2	1	5	6	1	1	4	2	2	2	4	4	5.10	3.43	-1.67
9	6	3	4	4	4	4	4	1	2	1	6	6	2	1	7	3	4	3	4	2	5.14	3.43	-1.71
10	7	5	5	5	4	2	3	2	3	1	6	6	3	1	6	2	4	2	5	3	5.41	3.57	-1.84
11	6	4	4	2	4	1	4	2	5	2	6	6	3	2	6	3	6	6	4	4	5.49	3.94	-1.55
12	6	4	6	7	5	4	4	2	5	2	6	6	1	1	3	2	3	4	5	5	5.22	4.06	-1.16
13	6	4	6	6	6	4	3	3	5	2	5	6	1	1	4	2	3	4	5	5	5.27	3.82	-1.45
14	7	6	5	5	4	4	4	3	5	2	6	6	1	1	6	5	2	3	5	5	5.45	4.18	-1.27
15	6	4	6	3	6	5	5	4	1	1	6	6	5	5	6	5	2	2	6	5	5.49	4.16	-1.33
16	7	5	7	6	5	6	5	4	2	1	6	6	6	6	4	5	6	6	6	6	5.84	4.88	-0.96
18	6	4	5	3	5	5	6	4	5	2	6	6	1	1	5	5	5	4	5	6	5.61	4.02	-1.59
19	7	4	5	4	5	3	5	3	2	1	6	6	3	2	2	4	3	2	5	6	5.06	3.78	-1.27
20	7	5	5	2	7	4	5	2	5	2	6	6	5	2	6	2	6	6	5	4	5.76	4.02	-1.75
21	4	3	7	6	3	5	4	1	2	1	6	6	3	2	2	3	4	4	5	6	4.82	3.59	-1.24
22	6	4	6	6	3	3	4	2	1	1	6	6	3	2	2	2	6	6	4	5	4.88	3.55	-1.33

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